BARCO-EMT GMBH

Professionelle Electronic

Ein Unternehmen der Gruppe BARCO n.v.

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Notice!

When ordering replacement parts or requesting price quotations, please specify the unit model and serial number as well as the exact part designation.

Due to product improvements made during the course of a manufacturing series and to changes in particular industrial components, the incompatibility of some parts cannot be avoided.

# Instruction Manual

# EMT 948

## Broadcast Turntable

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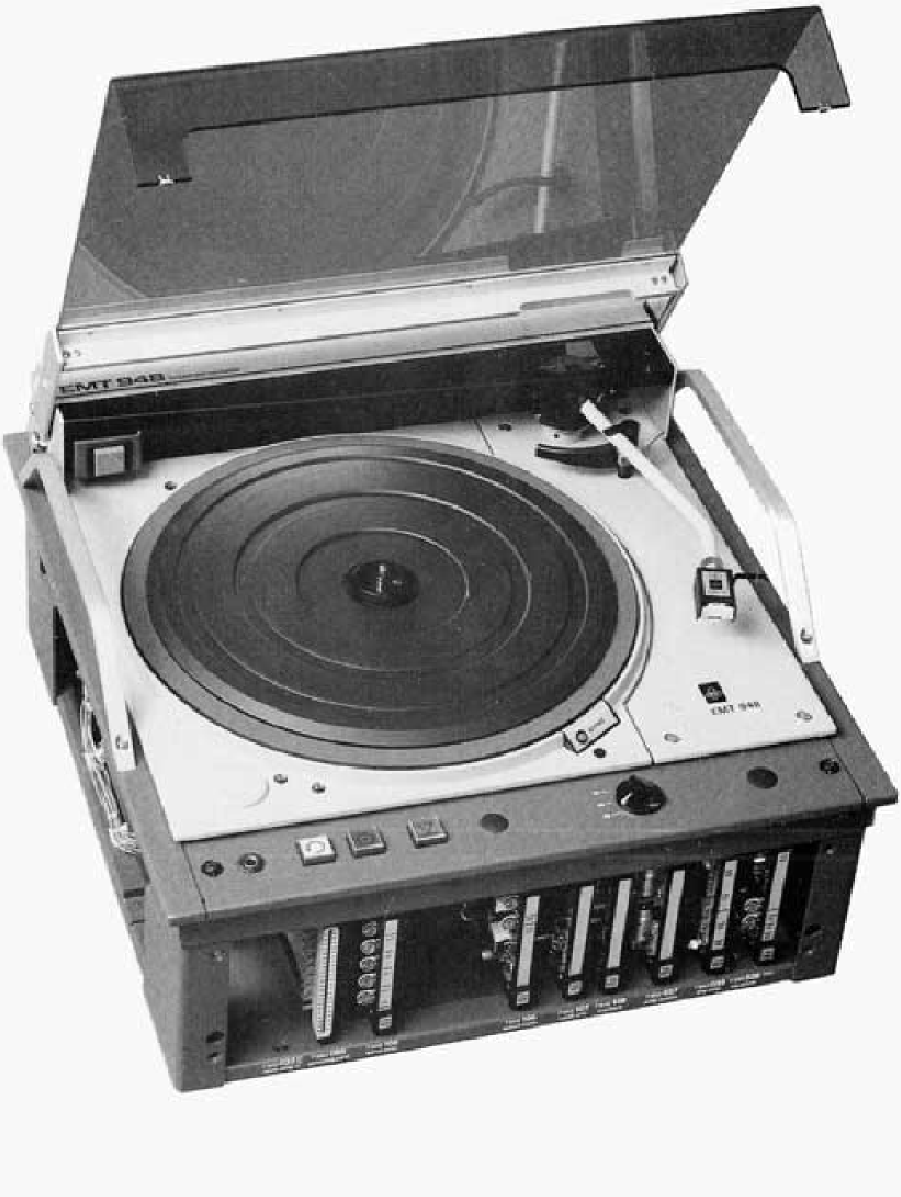
November 1991

Applies to units starting with serial no. 58 815.

Constructions and circuits are subject to change without notice.

# EMT 948



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# Connections and Preparation for Use

## A 1 Unpacking Instructions

- Place the carton in an upright position (as indicated on carton) and open.
- Remove the upper foam packing insert.
- Remove the accessories from the next foam insert and lift out the insert.
- Remove the turntable dust cover.
- Lift out the rigid foam cover.
- Grasp the turntable by the two handles and lift out from the lower rigid foam insert.
- The turntable platter and the rubber mat are located in the base of the foam insert.

The unit can now be prepared for operation with the appropriate accessories (tone arm counterweight, etc.).

**Important!**

Retain all packing materials for possible reshipment of the unit.

When repacking the unit, follow the reverse procedure with appropriate care.

Whenever the unit is repacked, do not forget to engage the two transport locks - chassis and motor bearing - and to remove the counterweight with the tube end of the tone arm. Tighten the screws firmly.

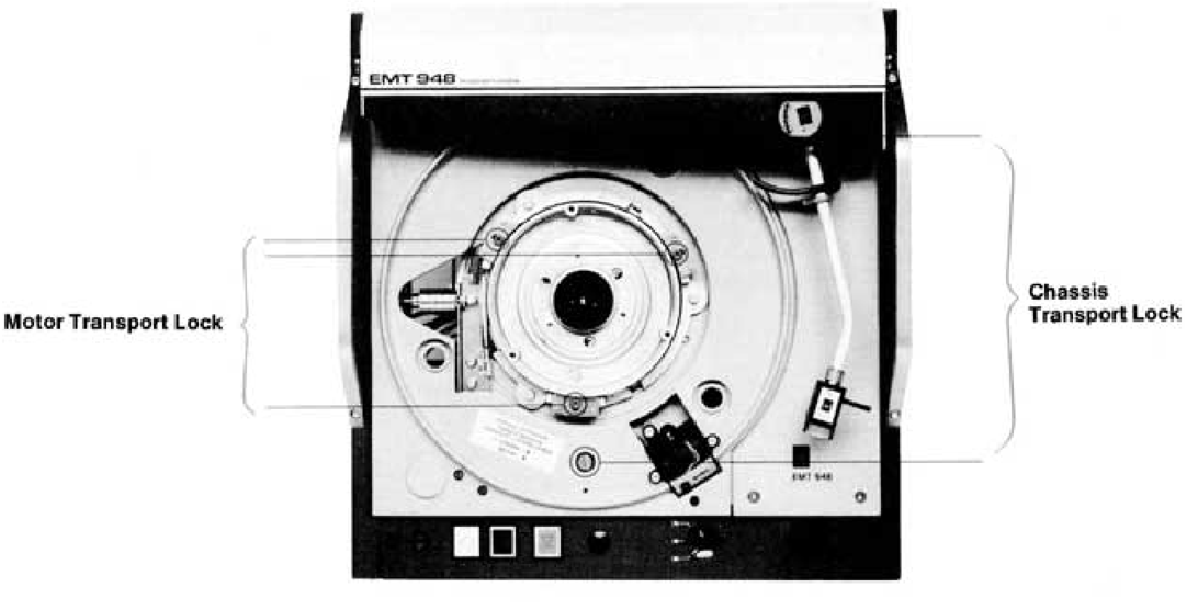
The tone arm should be firmly secured to the lift rest.

## A 2 Releasing the Transport Locks

The unit is fitted with two transport locks, which are accessible from above through the opening in the chassis for the turntable platter. The locks stabilize the chassis and protect the lower motor bearing against excessive stress due to axial and radial vibrations.

The motor is secured with three brass-tone strips, which extend into a ring-shaped groove in the rotor.

- Slightly loosen the three associated Allen screws (identified in red).
- Hold the rotor so that it cannot fall onto the lower bearing.
- Pull the three strips out of the groove and lower the rotor onto the bearing (approx. 1 mm).
- Retighten the Allen screws. Make sure that the strips do not touch the rotor, lest they impede the motion of the motor.



The transport lock for the suspended chassis is released by loosening the two large screws (identified in red) in the opening for the turntable platter. These two screws must be loosened completely, i. e., until they are pushed against the chassis from below by the built-in springs. The screws remain in the unit.

If the unit is to be secured for reshipment, proceed in reverse order. The three strips of the motor lock must be pressed somewhat against the inner wall of the groove to inhibit radial vibrations of the rotor.

## A 3 Turntable Platter

Attach the turntable platter to the rotor of the motor with three screws and place the rubber mat on the platter.

## A 4 Installation in Cabinets, Tables, or the EMT Console 9 948 970

A cutout of 442 x 457 x 157 mm (17.6" x 18.2" x 6.3") (width x lenght x depth) is required for installation in cabinets or tables.

The EMT Console 9 948 970 has been designed for the EMT 948 Broadcast Turntable. Space is provided to the left of the turntable for the installation of additional control elements such as a cue amplifier, cue loudspeaker, vario potentiometer, etc. This area is covered with a blank panel.

The space can be alternatively provided to the right of the turntable platter if specified with the order.

The console requires an installation space of 697 x 495 x 800 ±25 mm (27.8" x 19.7" x 31.9" ±1") (width x depth x height). The height of the legs can be changed, enabling the operating height to be adjusted between 775 (30.9") and 825 mm (32.9").

The console consists of the console chassis with blank panel, two side elements, a front panel, a rear panel, and four legs. Eight Allen screws, plastic cover caps, and an Allen key for attaching the legs are also supplied.

Assembly proceeds as follows. The two side elements are first screwed onto the chassis. The eight Allen screws are inserted for this purpose through the large openings in the side elements and screwed in tightly. The openings are then covered with the black cover caps.

The legs are screwed into the side elements until the desired operating height has been attained and then locked into place with the wrench supplied.

The rear panel, which can be identified by the somewhat larger side areas, is attached to the rear of the console where the feedthrough holes at the bottom of the chassis are located. The spring pins on the rear panel must snap into the two holes provided for this purpose in the side elements, at the level of the bottom of the chassis. Depress these spring pins slightly to insert. The rear panel is then swiveled upward and fastened to the chassis with the Phillips screws.

The front panel is mounted in the same manner as the rear panel.

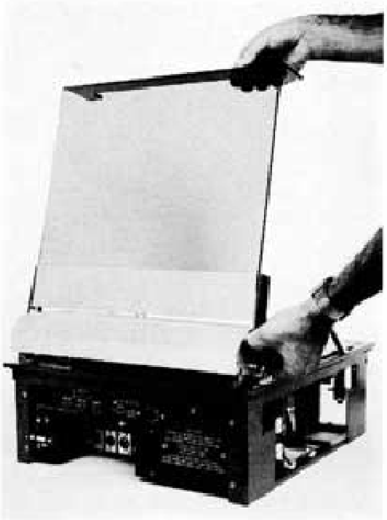
The EMT 948 Broadcast Turntable is inserted from above into the cutout provided in the console. The grounding cable attached to the console must be connected to the turntable.

# Connections and Preparation for Use

## A 5 Turntable Dust Cover

The plastic dust cover can be attached most easily to the unit in a perpendicular position. To facilitate installation, slightly press one of the side supports outwards.

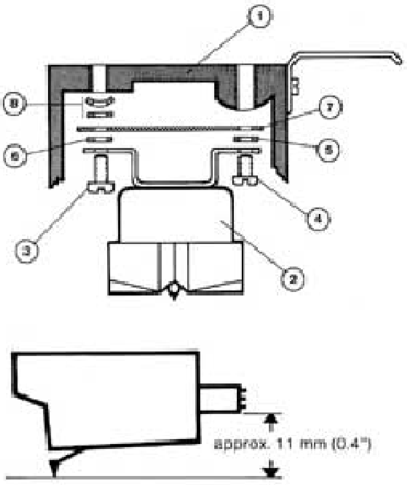
A small retaining bracket is delivered with the turntable to hold the dust cover in an open position. This bracket must be screwed onto the inner side of the assembly at the lower right to permit the dust cover to be closed only when bracket is pressed.



## A 6 Mounting a Pickup Cartridge into an EMT Cartridge Shell

Under the catalog number 9 948 120, the EMT 948 Broadcast Turntable is delivered with an empty EMT cartridge shell, including the hardware necessary for mounting the pickup cartridge selected.

Pos. 1 cartridge shell
2 pickup cartridge (with 1/2" mounting bracket)
3 screw, M 2.6 x 5.5
4 screw, M 2.6 x 5
5,6 spacing washers, 2.6 ø
8 bronze spring
(3–8: EMT accessories)
7 plastic strip — cartridge accessory (not necessarily required)



Mechanical assembly

The distance of 11 mm is achieved with an appropriate number of spacing washers. The height of the tone arm should be checked (Section A 7 of this instruction manual) and adjusted, if necessary.

Electrical connections:

red - right channel (a)
green - right channel (b)
white - left channel (a)
blue - left channel (b)

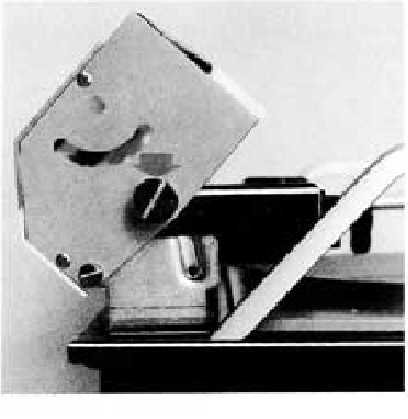
**Important!**

The cartridge circuit must remain balanced, that is, any bridge between one of the connecting pins and the cartridge body must be removed.

## A 7 Tone Arm Adjustments

**Mounting the Counterweight**

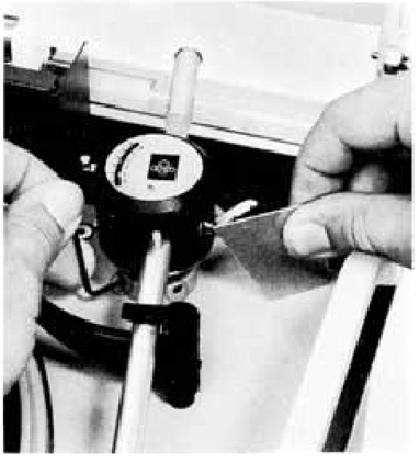
After loosening the two knurled screws at the right and left, tilt the bracket of the dust cover to the rear. Secure the counterweight with the tube piece on the rear end of the tone arm using the center screw; the countersunk side of the plastic sleeve must face the rear.



### Adjustment of Balance and Tracking Force

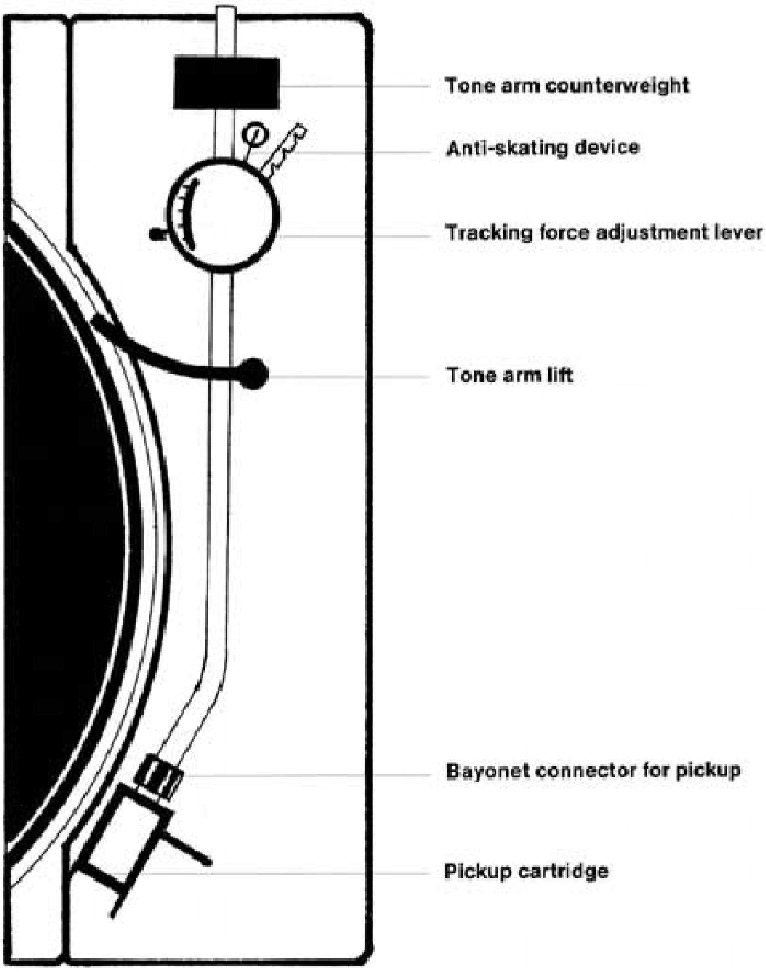
Insert the cartridge into the tone arm and tighten the bayonet connector. Set the tracking force adjustment lever to "0". Lower the tone arm lift and turn the counterweight on the threaded tube end until the stylus tip balances exactly in the plane of the record. Fix the counterweight in this position by gently tightening the Allen screw.

Set the tracking force adjustment lever to "2,5" (a tracking force of 25 mN, or 2.5 grams) for T-Series cartridges, or to the force specified by the cartridge manufacturer.



**EMT 929 Tone Arm**

(Dust cover and bracket not shown)



### Tone Arm Height

The height of the tone arm is adjusted with the two Allen screws in the pedestal flange at the base of the tone arm.

The horizontal bearing should lie 35 mm above the chassis. To determine the correct height, place the trapezoidal gauge on the chassis. The tone arm height is adjusted correctly when the point of the gauge lies exactly at the middle of the bearing adjustment screw.

### Anti-Skating Device

An undesirable force, known as skating force, is produced with any pickup arm due to the tracking angle and the friction between the stylus and the record. The magnitude of this force is about 1/10 of the tracking force employed, and it causes the pickup stylus to be pressed rather unidirectionally against the inner, left-hand groove wall. The tracking force on the right-hand wall is therefore somewhat lower than on the left.

The EMT 929 Tone Arm employs an anti-skating device which consists of a small weight attached to a nylon thread, acting upon the tone arm over a lever arm to produce the required counterforce.

### Mounting the Anti-Skating Weight

Lower the anti-skating weight with nylon thread through the hole in the turntable chassis. The small clear plastic disk will prevent the weight from falling through. Feed the nylon thread into the wire eyelet, and hang the loop at the end onto the middle notch of the lever.

This setting is correct for the nominal tracking force of the TSD 15 pickup cartridge of 25 mN (2.5 grams). The inner notch corresponds to a tracking force of 20 mN (2 grams), the outer notch to a force of 30 mN (3 grams).

# Connections and Preparation for Use

### A 8 Mains Power Connection

Each unit is set at the factory to the mains voltage specified with the order. The set voltage is visibly indicated on the selector on the rear of the unit.

The following mains voltages may be selected: 100, 110, 120, 220, 230, and 240 V.

For 100 - 120 V, a 1 A slow-blow fuse is required; for 220 - 240 V, a 0.5 A slow-blow fuse. The specified mains frequency is 50 - 60 Hz.

### A 9 Grounding Connections

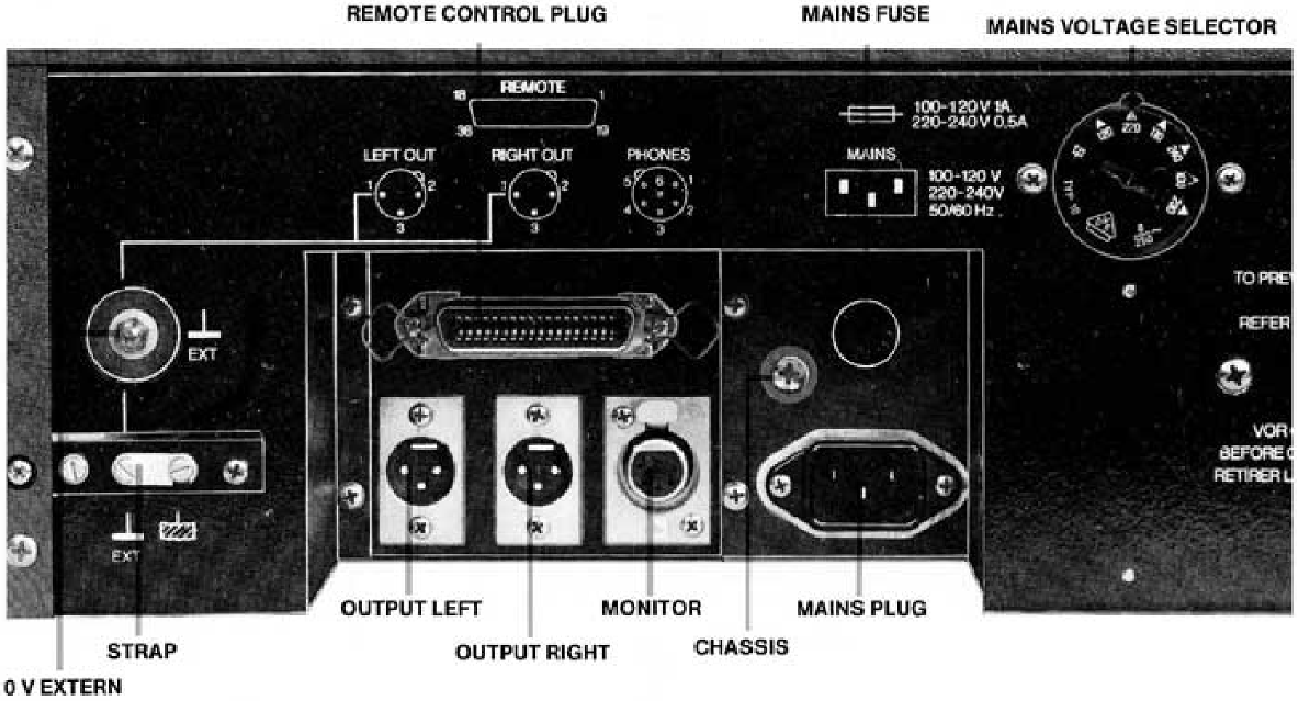
The grounding wire of the mains power cable is permanently connected to the chassis of the turntable. The voltage potential labeled "0 V extern" (⊥ ext., the shield potential of the audio cables) is connected at the factory to the chassis ⏚. This connection can be removed by unscrewing the strap on the rear of the unit if required for preventing disturbances ("hum loops") due to electromagnetic fields.

An additional grounding screw is provided for the "0 V extern" potential, e.g., for centrally grounding all cable shields.

### A 10 Audio Connections

The audio connectors are located on the rear of the unit. The pin connections of the mating connectors for the line outputs and for the headphone/monitor outputs are indicated on the audio block diagram.

# Connections and Preparation for Use


REMOTE CONTROL PLUG
MAINS FUSE
MAINS VOLTAGE SELECTOR
REMOTE
18
1
36
19
LEFT OUT
RIGHT OUT
PHONES
100-120 V 1A
220-240 V 0.5A
MAINS
100-120 V
220-240V
50/60 Hz
EXT
EXT
OUTPUT LEFT
MONITOR
MAINS PLUG
STRAP
OUTPUT RIGHT
CHASSIS
0 V EXTERN

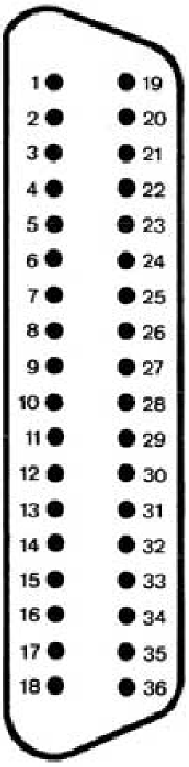
## A 11 Remote Control Connector

Mating Connector: Amphenol 57-30360 (4 203 234).
The pin connections of the remote control connector are divided into three groups:

1. Ext. Cue Amplifier
2. Remote Control
3. Test Signals

**Pin Connections:**

| Pin | Connection |
|---|---|
| 1 | +27 V Cue-Ampl. |
| 2 | 0 V Cue-Speaker |
| 3 | +12,5 V Cue-Ampl. |
| 4 | 0 V Cue-Ampl. |
| 5 | 0 V Lamps |
| 6 | Mono (0 V)/Stereo |
| 7 | Remote Start (+ Faderstart) |
| 8 | Remote Stop |
| 9 | Local Only |
| 10 | Remote Only |
| 11 | Vario Pot. (more pos. volt.) |
| 12 | Vario Pot. (less pos. volt.) |
| 13 | Vario Pot. (Schleifer) |
| 14 | Vario (0 V)/Quartz |
| 15 | – |
| 16 | – |
| 17 | – |
| 18 | – |


1
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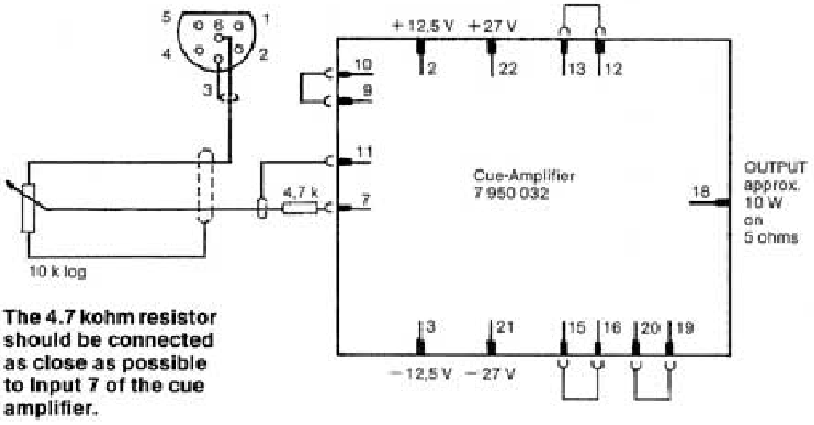
36

| Pin | Connection |
|---|---|
| 19 | −27 V Cue-Ampl. |
| 20 | 0 V Cue-Speaker |
| 21 | −12,5 V Cue-Ampl. |
| 22 | 0 V Cue-Ampl. |
| 23 | 0 V Lamps |
| 24 | 0 V Pushbuttons |
| 25 | +20 V Lamps |
| 26 | +20 V Lamps |
| 27 | Lamp Lift |
| 28 | Lamp Stop |
| 29 | Lamp Start |
| 30 | Phones Mono (Cue-Ampl.) |
| 31 | Frequ.-Volt.-Inf. |
| 32 | Pulsphase |
| 33 | Tacho |
| 34 | 0 V Motor |
| 35 | Motor-current I |
| 36 | Motor-current II |

# Connections and Preparation for Use

## Cue Amplifier



**The 4.7 kohm resistor should be connected as close as possible to Input 7 of the cue amplifier.**

If required, the broadcast turntable may be equipped with the 7950 032 Cue Amplifier. In the 9948 971 Console, the amplifier board is already delivered fully installed with a loudspeaker. In all versions of the broadcast turntable with order no. 9948..1, the cue amplifier has been installed without a loudspeaker. With the 9948 941 Cue Amplifier Kit, all other versions may be equipped with a cue amplifier.

The basic installation of the 7950 032 Cue Amplifier Board is illustrated in the diagram.

Refer also to Cue Amplifier on page 41, the audio block diagram on page 49, and the Interconnection Board, cue amplifier option.

**Important!** Turn off the mains power before connecting the cue amplifier to the turntable.

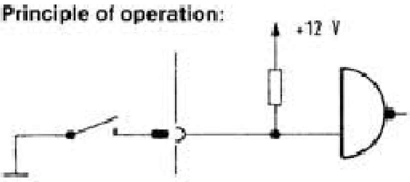
## Remote Control and Indicator Lamps

The remote control connections are designed for activation of a function with 0 V.

Example:

Pin 9 Local Only 0 V: Operation possible only at the unit
Pin 7 Remote Start 0 V: The turntable starts. In this case, pin 9 (Local Only) may not lie at 0 V.

Principle of operation:

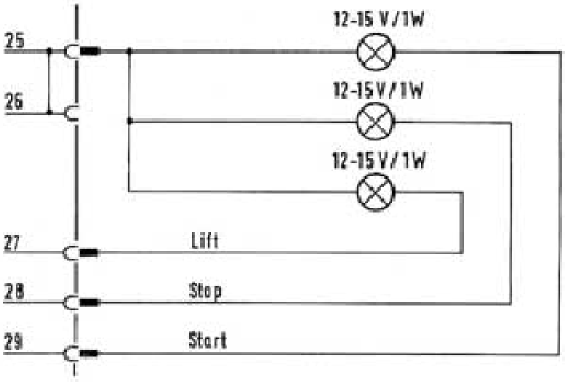


Unused or open inputs are pulled up to 15 V through a resistor (see diagram).

The following operating modes can be established using the Local Only (pin 9) and Remote Only (pin 10) connections:

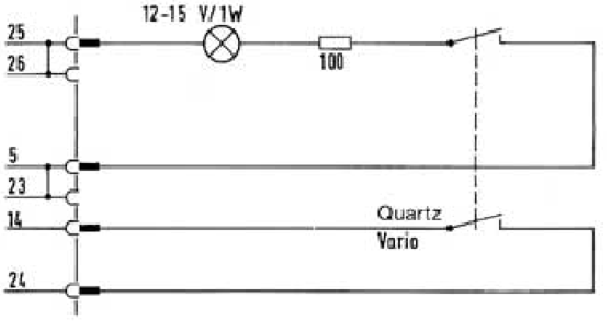
| Local Only | Remote Only | |
|---|---|---|
| Input open | Input open | Local and remote operation possible |
| 0 V | Input open | Only local operation possible |
| Input open | 0 V | Only remote operation possible |
| 0 V | 0 V | Operation not possible (can be used for inhibiting operation) |

If the momentary operating state of the turntable is to be indicated at a remote location such as the mixing console, indicator lamps for the Start, Stop, and Lift functions can be connected to the corresponding remote control pins.



**The voltage drop on the lamps is approx. 12 V in this circuit.**

For the indication of additional functions, e.g., Vario/Quartz Switching, Remote Only, etc., the following connection scheme can be employed:

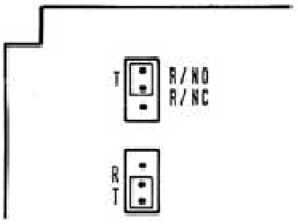


**Current drain on pins 25 and 26 max. 400 mA, corresponding to five miniature lamps**

**Example: Vario/Quartz Switching**

### Start/Stop, Fader Start

**Position and function of the two programming plugs on the Interface Board (7 948 108):**

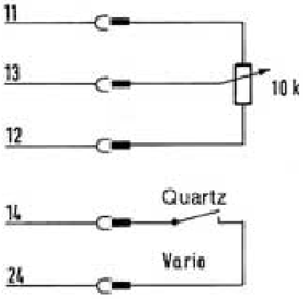


Two connections are provided on the remote control connector for the Start and Stop functions: pin 7 for Remote Start and pin 8 for Remote Stop. Remote control is not possible when pin 9 (Local Only) is connected to ground. To enable fader starts, two programming plugs must be alternately inserted on the Interface Board:

T ≙ Pushbutton Start; the Start and Stop functions are initiated through pins 7 and 8 of the remote control connector.
R ≙ Start/Stop through a fader contact or switch; the Start and Stop functions are initiated through pin 7 of the remote control connector.
R/NO ≙ The fader contact is normally open.
R/NC ≙ The fader contact is normally closed.

### Variable Speed

**Circuit diagram for Vario Operation:**



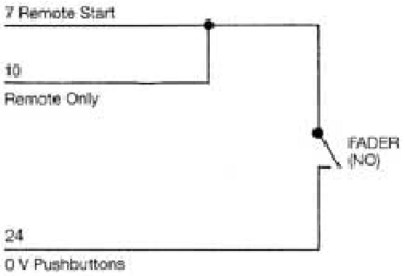
If variable speed operation be desired, pin 14 of the remote control connector must be connected to ground. The nominal speed can be varied approximately ± 25 % with a potentiometer connected to pins 11, 12, and 13. The internal circuitry of the unit is designed such that the turntable rotates more slowly when the voltage on the wiper is increased.

### Test Signals

Pins 31 - 36 simplify adjustments of the unit and enable fault detection to be accomplished rapidly in the event of improper drive system performance. Refer to the block diagram and the servicing section.

# Connections and Preparation for Use

### Remote Control Connector



If remote starting is implemented with a normally open (NO) contact, the unit runs when the fader contact is closed. In this case, the remote start function may be used simultaneously to mute the headphone or monitor output signals (at the six-pin audio connector) by connecting pins 10 and 7 together on the remote control connector. The programming plug positions are given in part 2 of A 13 Muting.

## A 12 Levels

The unit is adjusted to the program levels given in the control report, in general to + 6 dB ≙ 1.55 V. The corresponding test record exhibits a full modulation level of $\hat{v} = 10$ cm/s at 1 kHz (e. g., DIN 45 544 Test Record). The levels at 315 Hz and $\hat{v} = 5.42$ cm/s correspond to the full modulation level cited above.

Level adjustments may be accomplished easily with the potentiometers projecting toward the front of the printed circuit boards. The locations of these potentiometers are indicated on the label strips. Possible level differences between the channels of a pickup cartridge are balanced out with the "right adj." potentiometer; the adjustment range is approximately 4 dB.

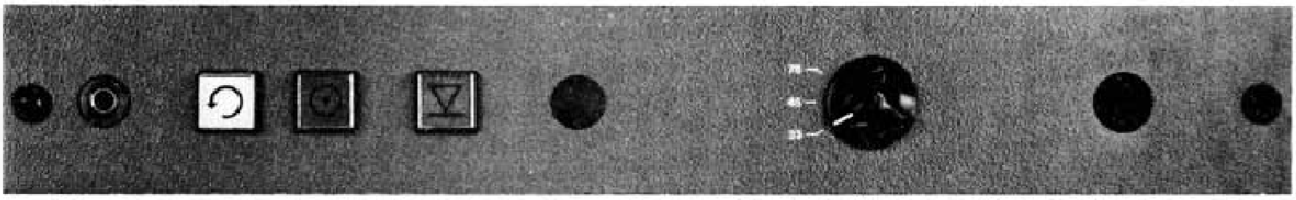
## A 13 Muting

The standard unit is equipped with the following muting functions:

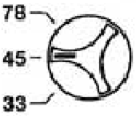
1. The line outputs are muted during the Start and Stop phases. This muting function can be defeated by changing the positions of two programming plugs on the Line Amplifier Board (EMT 7 950 039).
2. The headphone outputs on the six-pin audio connector are muted in the Remote Only mode. This muting function can be defeated for the mono signal (pins 6 and 3 of the six-pin audio connector) by changing the position of a programming plug on the Equalizer Board (EMT 7 950 038 or EMT 7 950 088). The muting function for the stereo signal (pins 1, 2, 4 and 5) can be defeated by changing the position of a programming plug on the Interconnection Board.

# Operation

Transport locks released? (See A 2, page 4)
Mains voltage selector set to correct position? (See A 8, page 8)
Tone arm adjusted? (See A 7, page 6)



**Switch Functions**

| | |
|---|---|
| Power Switch | Located under the dust cover to the rear left. When power is applied, a cold-cathode lamp illuminates the record. |
| Reverse | Front left. Pressing the button rotates the turntable platter in the reverse direction at 33-1/3 RPM; releasing the button stops the motion.<br>If the button be pressed when the turntable platter is rotating forward, reverse rotation is effected. |
| Start/Stop | Front left. Pressing the button starts platter rotation (the indicator lamp illuminates); pressing again stops the platter (the lamp is extinguished).<br>The LED (SYNC) at the edge of the platter is lit when the platter has reached nominal speed. |
| Tone Arm Lift | Front left. Pressing the button lowers the tone arm (the indicator lamp illuminates); pressing again lifts the arm. |
|  Speed Selector | Front right |

The adaptor in the middle of the turntable platter can be turned to lock into the upper or lower position.

**Cueing to a desired position (e.g., the beginning of modulation)**

Position the raised tone arm over the desired point on the record and lower the arm. The cueing position can be found easily by alternately actuating the Start and Reverse buttons while monitoring with headphones.

A desired point on the record can also be found manually by rotating the turntable platter back and forth.

When the point has been found, hold a finger on the edge of the platter at the black point corresponding to the selected speed and rotate the platter in a counterclockwise direction to the black point near the pickup cartridge.

The rotational distance corresponds to the acceleration time needed for the platter to attain the selected speed. During this time, the line outputs are muted (see A 13, page 12).

The record itself should not be touched when rotating back and forth. For the purpose of manual cueing, the edge of the turntable platter extends approximately 24 mm beyond the record.

# Technical Description

## C 1 Drive System

The EMT 948 Broadcast Turntable is equipped with a direct drive system, that is, the platter is rigidly connected to the rotor of the drive motor by a shaft. This rigid connection enables rapid acceleration of the platter for "quick starts".

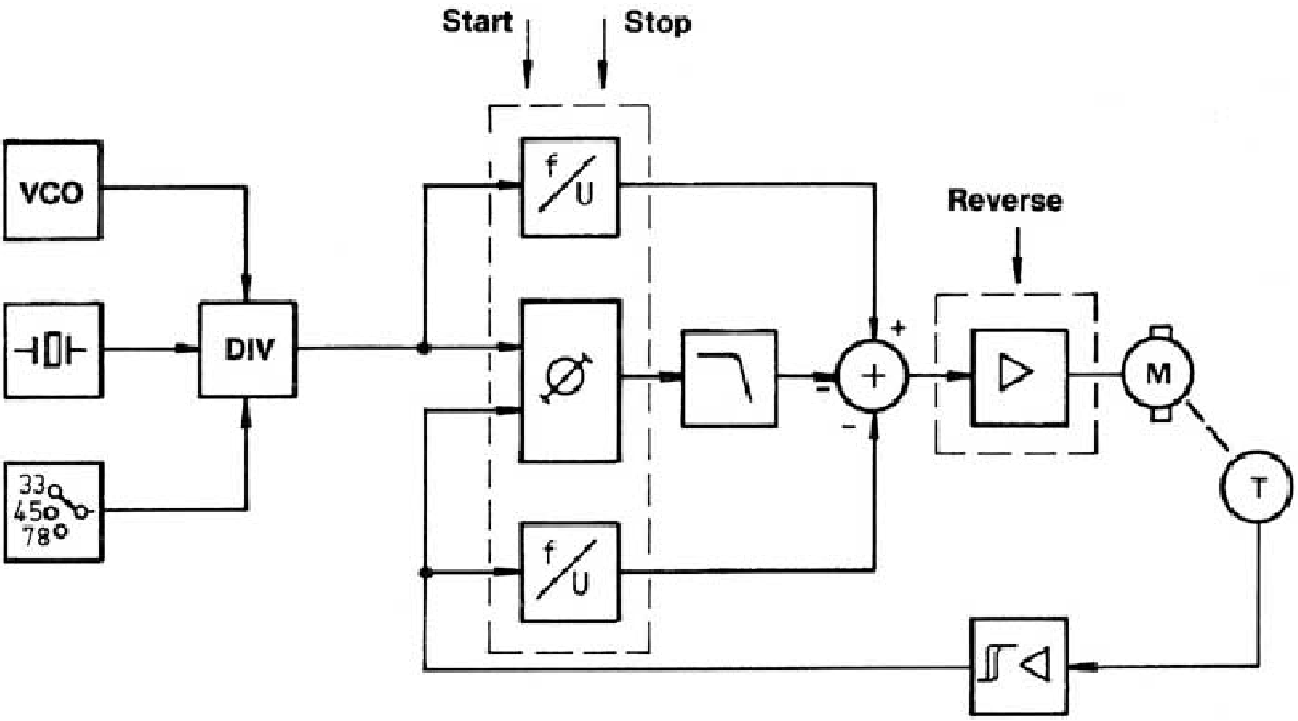
Rotational drive is provided by a controlled dc motor. Commutation is performed using Hall generators, thereby totally eliminating wear due to mechanical contact.

A high-resolution tachometer generator magnetically senses the momentary speed of the turntable platter and delivers a sinewave signal to the control board. There, two comparison processes are performed with a reference signal obtained from a highly stabile quartz oscillator.

In one process, the tachometer signal and reference signal are converted into frequency-dependent signals (f/u converter) and compared. The large acceleration signals required for Start and Stop are obtained from this comparison. In the second process, the relative phases of the tachometer signal and the reference signal are compared in a phase locked loop (PLL) circuit. The resultant control signal is employed in the range of the nominal rotational speed to eliminate small phase variations between the tachometer signal and the reference signal.

The various speeds (33-1/3, 45, 78 min$^{-1}$) are attained by changing the frequency of the reference signal. This process is performed with a programmable divider, which divides the signal from the quartz oscillator down to particular frequencies.

If variable speed is to be employed instead of the nominal speed, a VCO (voltage controlled oscillator) is used as the reference source. The frequency produced by the VCO is controlled by a dc voltage from an external potentiometer. Vario/quartz switching is accomplished by a logic signal fed externally through the remote control connector.

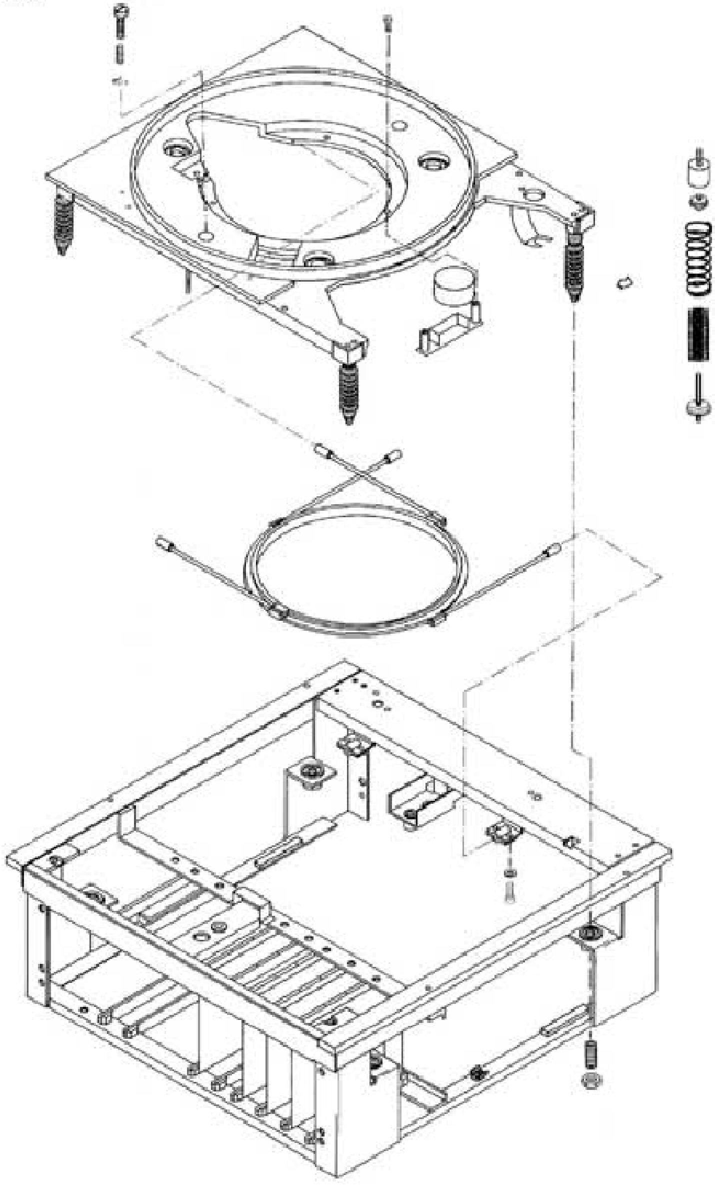


## C 2 Chassis and Suspension

Broadcast schedules are relentless in their demands for exact timing. Precise fade-ins with quick turntable starts must be possible during live programs. Therefore, a short run-up time of the platter to the nominal speed represents an important requirement for a broadcast turntable. The use of the most modern drive system principles, a light platter, a motor with low-inertia rotor, and direct drive allows rapid starts and stops to be achieved optimally.

With such operation, however, considerable reaction moments occur which lead to such effects as rotational vibration around the axis perpendicular to the turntable platter. While compensation for purely lateral or vertical moments can be made by dynamically balancing the tone arm, this does not hold true for rotational moments because of the finite mass of the arm. The rotational moments cause tracking disturbances and produce unpleasant wow and flutter effects, especially during the starting phase.

By means of a new mechanical design, which employs a stiff ring with two rods connected to the lower frame and two further rods to the chassis, the excitation of rotational vibrations is highly damped. The chassis can therefore be dimensioned for lower mass, considerably reducing the total weight of the unit. The required isolation from mechanical and solid-borne vibrations is achieved by four coil springs, upon which the chassis is suspended.



# Technical Description

## C 3 Tone Arm

The proven EMT 929 precision tone arm is employed. This arm is statically and dynamically balanced in all three dimensions, reducing its sensitivity to external disturbances (such as mechanical shocks and vibrations) to an absolute minimum. Through use of precision ball bearings for all degrees of freedom and exceptionally supple internal tone arm leads (terminated in an audio connector for the pickup signal), extremely low bearing friction is achieved. The maximum force, including torsional forces, measured at the stylus tip is 0.5 mN (or 50 milligrams). The stylus force is produced by spring tension and can be adjusted by means of a lever to any value between 0 and 50 mN (0 to 5 grams). An anti-skating device supplements the basic tone arm, which fulfills all state-of-the-art requirements and makes further developments unnecessary in the foreseeable future. Of particular importance is the careful tuning of the resonant frequency of the tone arm integrated with the EMT TSD-15 pickup cartridge with regard to the vibrational characteristics of the entire turntable system. Experience has shown that damage to the diamond stylus is not caused by record play but rather by improper lowering of the stylus onto the record surface. This procedure has been automated, therefore, in order to increased operational reliability. A small, internal, low-noise motor raises and lowers the tone arm. The adjustable lowering time is approximately 200 ms, which is more rapid than achievable with manual lowering, yet insures that the maximum allowable forces on the stylus cantilever will never be exceeded.

## C 4 Amplifiers

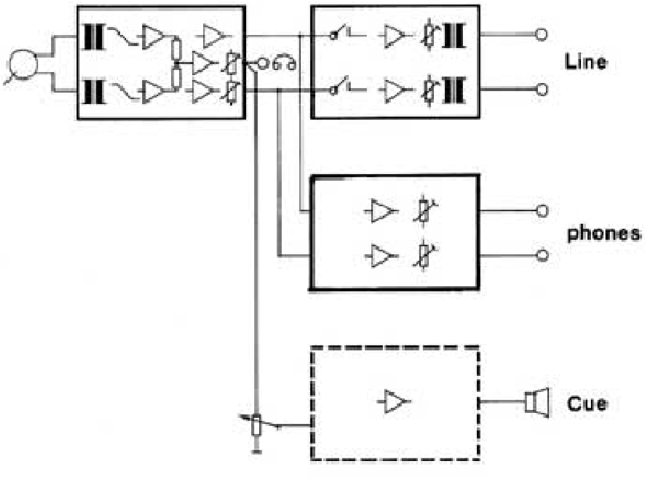
In broadcast studio use, a phonograph turntable constitutes a program source fulfilling standard matching requirements. For this reason, integrated equalizing amplifiers are employed. In addition to the standard equalization time constants of 3180/318/75 µs, the equalization can be switched to 3180/318/0 µs (FLAT) for the reproduction of test records. Two filters are also included which attenuate signals lying outside of the corner frequencies of 30 Hz and 25 kHz as a preventative against disturbance frequencies. The maximum output level of + 22 dB on a load of 200 Ohms reflects the trend toward higher recording levels and the resultant requirements for greater signal headroom.

In the standard version, the amplifier consists of two plug-in printed circuit boards, the stereo preamplifier with standard equalization and the stereo line amplifier.

The line outputs are automatically muted when the platter is stopped and during Start run-up, as controlled by the motor speed. The muting function can be defeated with programming plugs.

A monitor output, mono and stereo, is provided for purposes such as cueing. Headphones or an external amplifier may be connected to the output.

A 10 W cue amplifier is available as an option.



## Instructions for Use

The EMT 948 block diagram provides information concerning the designation of signals and the connecting leads between the individual circuit boards of the motor drive system.

In the descriptions accompanying the circuit diagrams, the following abbreviations are employed for the pins of integrated circuits:

6/Z 601 ≙ pin 6 of integrated circuit no. 601

The following designations apply for logic signals:

LOW ≙ approx. 0 V
HIGH ≙ approx. 12 — 15 V

Instruments required for servicing:

1 audio millivoltmeter
1 dual-channel oscilloscope
1 dc millivoltmeter

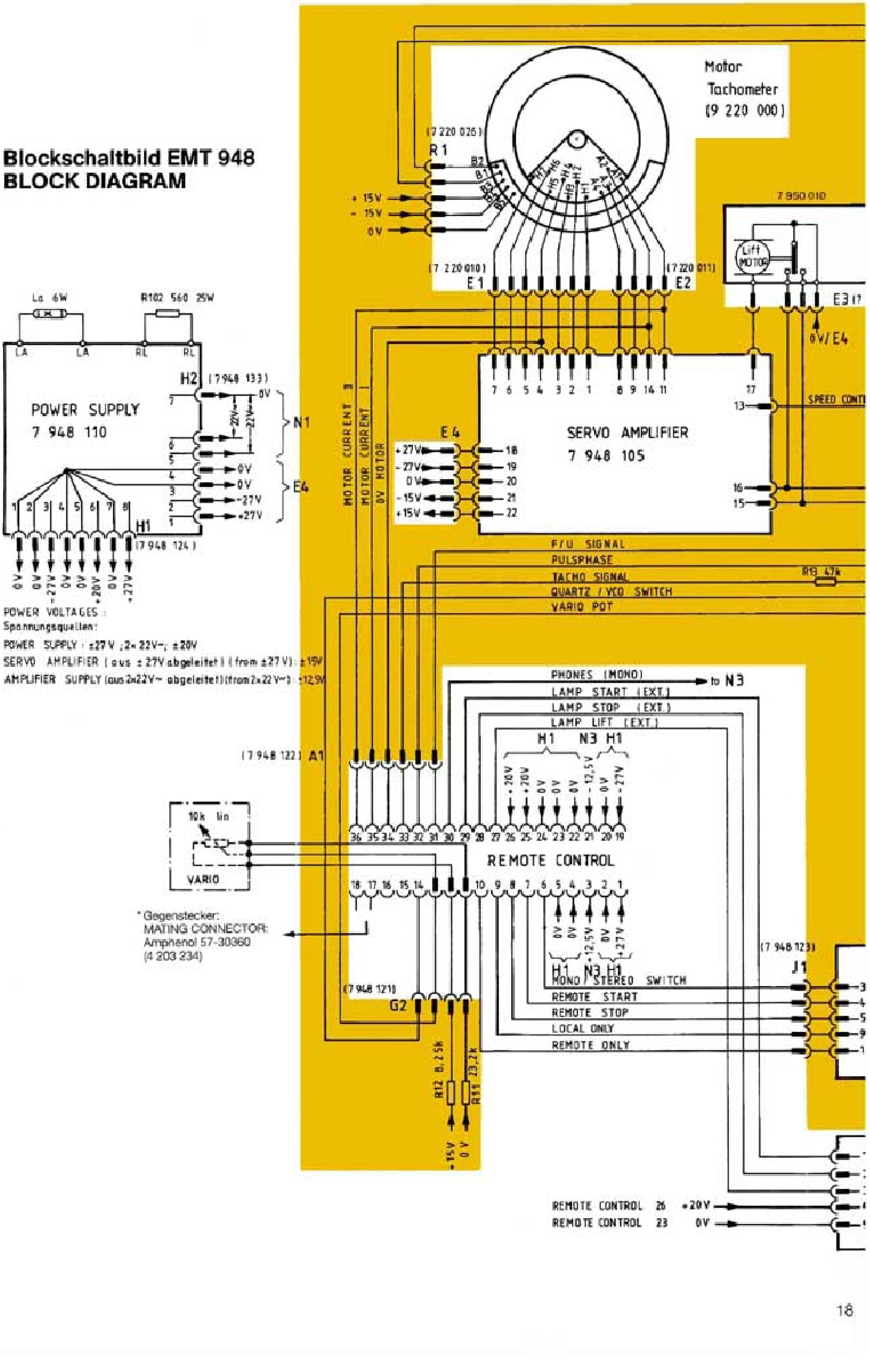
The following abbreviations are employed in the circuit diagrams:

| | |
|---|---|
| AMPS | Amplifier Supply |
| PAN | Control Panel |
| EQU | Equalizer |
| INT | Interface |
| LINE | Line Amplifier |
| OSZ | Oscillator |
| PWS | Power Supply |
| REM | Remote Control (connector) |
| SERV | Servo Amplifier |
| SPC | Speed Control |
| MOT | Motor |
| BRAK | Brake |
| MON | Aux. Monitor |

Auxiliary Monitor on
Interconnection Board

**Note:** No boards should be removed or put into the unit with the power switched on.

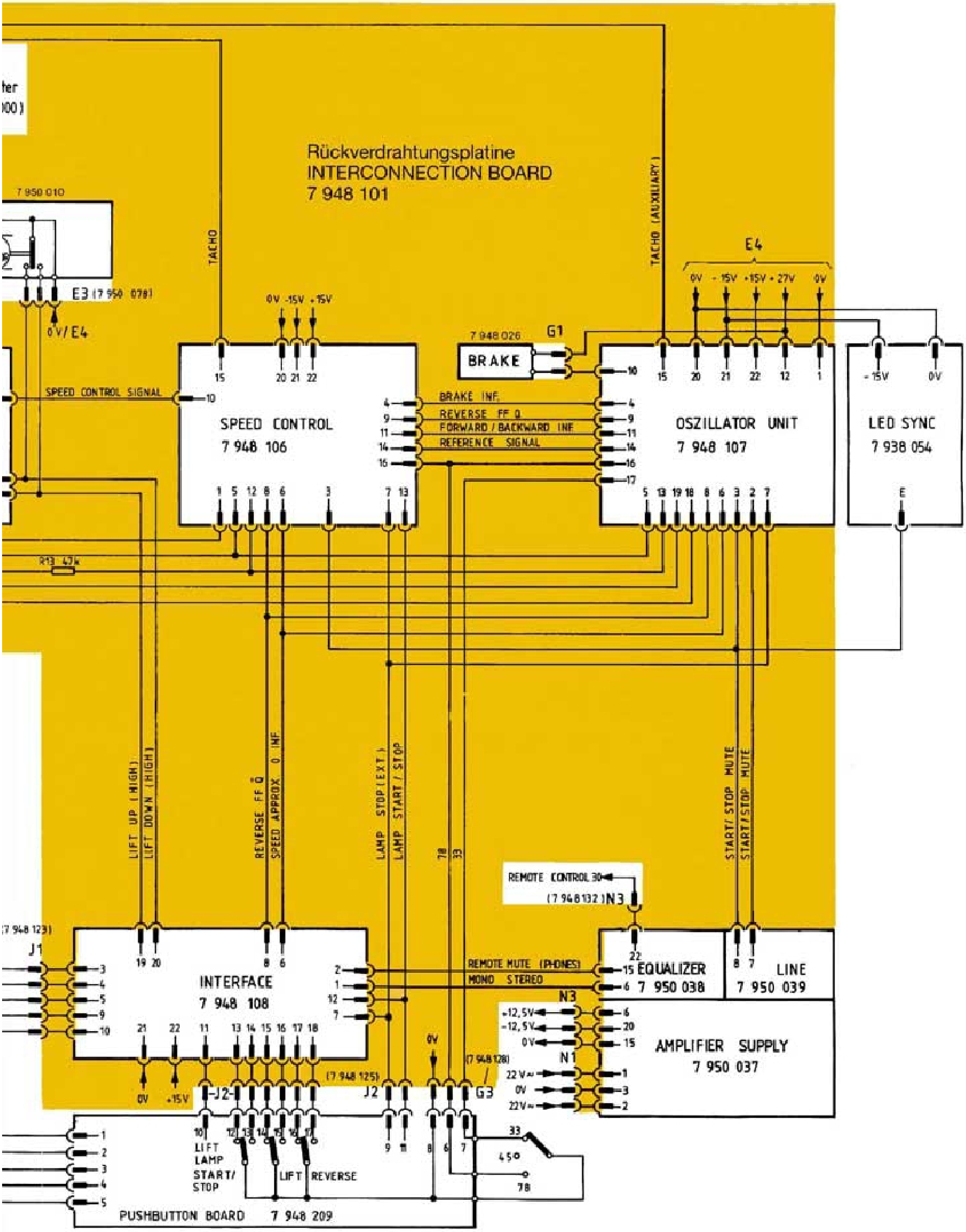
# Blockschaltbild EMT 948
# BLOCK DIAGRAM

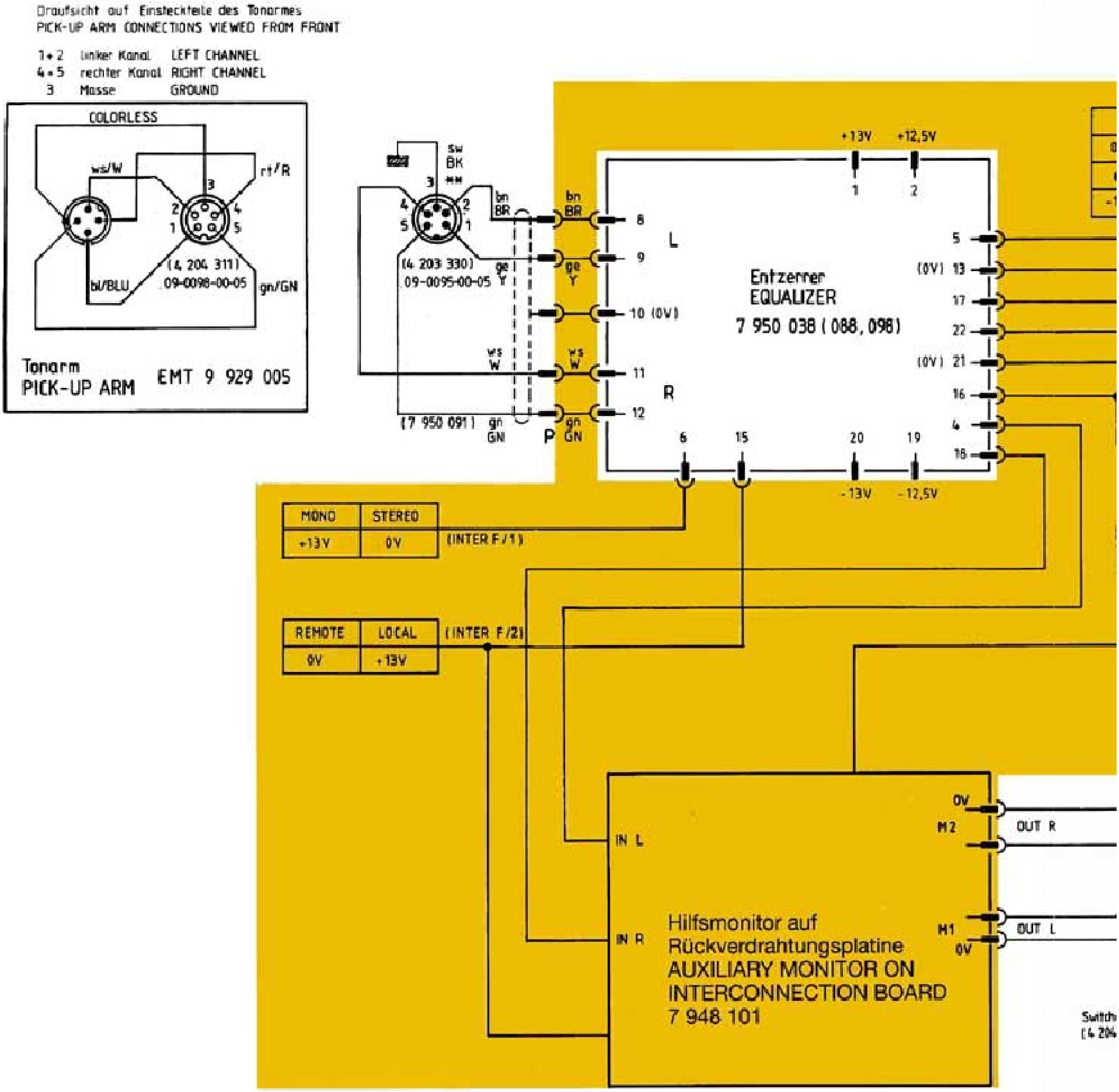

Motor Tachometer (9 220 000)
(7 220 026) R1
B2
B1
+15V
-15V
0V
(7 950 010)
Lift MOTOR
(7 220 010) E1
(7 220 011) E2
E3
0V/E4
La 6W
R102 560 25W
LA
LA
RL
RL
H2 (7 948 133)
POWER SUPPLY 7 948 110
N1
E4
22V~
22V~
0V
-27V
+27V
H1 (7 948 124)
0V
0V
-27V
0V
0V
+20V
0V
+27V
MOTOR CURRENT II
MOTOR CURRENT I
0V MOTOR
SERVO AMPLIFIER 7 948 105
+27V
-27V
0V
-15V
+15V
SPEED CONT
F/U SIGNAL
PULSPHASE
TACHO SIGNAL
R13 47k
QUARTZ / VCO SWITCH
VARIO POT
PHONES (MONO)
to N3
LAMP START (EXT.)
LAMP STOP (EXT.)
LAMP LIFT (EXT.)
(7 948 122) A1
H1
N3
H1
+20V
+20V
0V
0V
0V
-12,5V
0V
+27V
10k lin
VARIO
REMOTE CONTROL
+12,5V
+27V
MONO / STEREO SWITCH
REMOTE START
REMOTE STOP
LOCAL ONLY
REMOTE ONLY
(7 948 123) J1
(7 948 121) G2
R12 8,25k
R11 23,2k
-15V
0V
REMOTE CONTROL 26 +20V
REMOTE CONTROL 23 0V

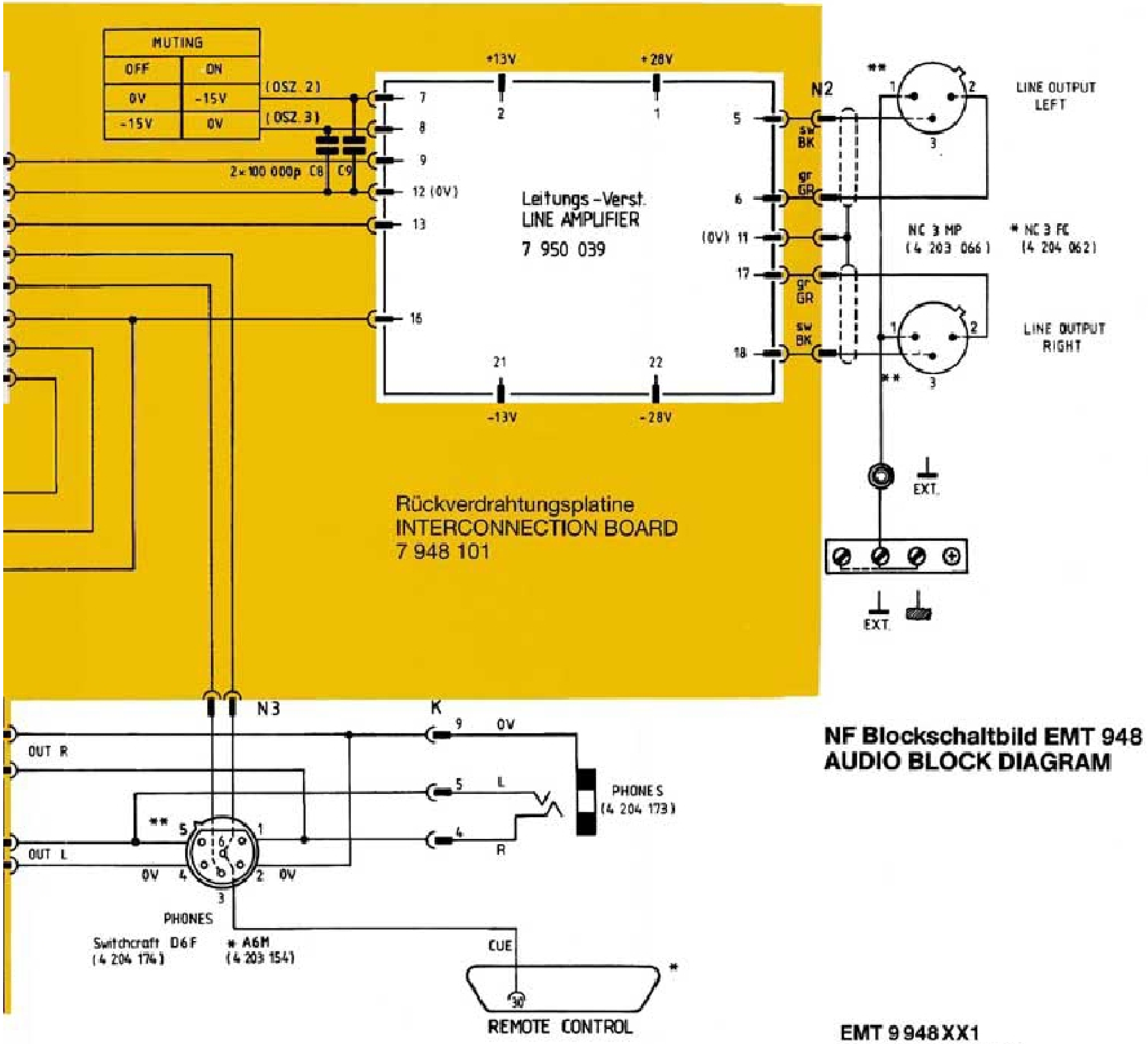
POWER VOLTAGES:
Spannungsquellen:

POWER SUPPLY: ±27V ; 2× 22V~; ±20V
SERVO AMPLIFIER (aus ± 27V abgeleitet) (from ±27 V): ±15V
AMPLIFIER SUPPLY (aus 2×22V~ abgeleitet)(from 2×22 V~): ±12,5V

* Gegenstecker:
MATING CONNECTOR:
Amphenol 57-30360
(4 203 234)


ter
000)
Rückverdrahtungsplatine
INTERCONNECTION BOARD
7 948 101
7 950 010
E3 (7 950 078)
0V/E4
TACHO
TACHO (AUXILIARY)
E4
0V -15V +15V +27V 0V
0V -15V +15V
7 948 026
G1
BRAKE
SPEED CONTROL SIGNAL
SPEED CONTROL
7 948 106
BRAKE INF.
REVERSE FF Q
FORWARD / BACKWARD INF.
REFERENCE SIGNAL
OSZILLATOR UNIT
7 948 107
LED SYNC
7 938 054
-15V
0V
E
R13 47k
LIFT UP (HIGH)
LIFT DOWN (HIGH)
REVERSE FF Q
SPEED APPROX 0 INF
LAMP STOP (EXT)
LAMP START / STOP
78
33
START/STOP MUTE
START/STOP MUTE
REMOTE CONTROL 30
(7 948 132) N3
(7 948 123)
J1
INTERFACE
7 948 108
REMOTE MUTE (PHONES)
MONO STEREO
EQUALIZER
7 950 038
LINE
7 950 039
N3
+12,5V
-12,5V
0V
N1
22V~
0V
22V~
AMPLIFIER SUPPLY
7 950 037
0V
+15V
J2
(7 948 125)
J2
0V
(7 948 128)
G3
LIFT
LAMP
START/
STOP
LIFT
REVERSE
33
45
78
PUSHBUTTON BOARD 7 948 209


Draufsicht auf Einsteckteile des Tonarmes
PICK-UP ARM CONNECTIONS VIEWED FROM FRONT
1+2 linker Kanal LEFT CHANNEL
4+5 rechter Kanal RIGHT CHANNEL
3 Masse GROUND
COLORLESS
ws/W
rt/R
bl/BLU
gn/GN
(4 204 311)
09-0098-00-05
Tonarm
PICK-UP ARM
EMT 9 929 005
sw
BK
(4 203 330)
09-0095-00-05
bn
BR
ge
Y
ws
W
gn
GN
(7 950 091)
P
8
9
10 (0V)
11
12
L
R
+13V
+12,5V
1
2
Entzerrer
EQUALIZER
7 950 038 (088, 098)
5
(0V) 13
17
22
(0V) 21
16
4
18
6
15
20
19
-13V
-12,5V
MONO
STEREO
+13V
0V
(INTER F/1)
REMOTE
LOCAL
0V
+13V
(INTER F/2)
IN L
IN R
0V
M2
OUT R
M1
OUT L
0V
Hilfsmonitor auf
Rückverdrahtungsplatine
AUXILIARY MONITOR ON
INTERCONNECTION BOARD
7 948 101


MUTING
OFF
ON
0V
-15V
-15V
0V
(OSZ. 2)
(OSZ. 3)
2×100 000p C8 C9
7
8
9
12 (0V)
13
16
+13V
+28V
2
1
21
22
-13V
-28V
Leitungs-Verst.
LINE AMPLIFIER
7 950 039
5
6
(0V) 11
17
18
N2
sw BK
gr GR
gr GR
sw BK
**
1
2
3
LINE OUTPUT LEFT
NC 3 MP (4 203 066)
* NC 3 FC (4 204 062)
LINE OUTPUT RIGHT
EXT.
EXT.
Rückverdrahtungsplatine
INTERCONNECTION BOARD
7 948 101
N3
K
9
0V
5
L
4
R
PHONES (4 204 173)
OUT R
OUT L
**
5
1
6
a
b
0V
4
2
0V
3
PHONES
Switchcraft D6F (4 204 174)
* A6M (4 203 154)
CUE
30
*
REMOTE CONTROL

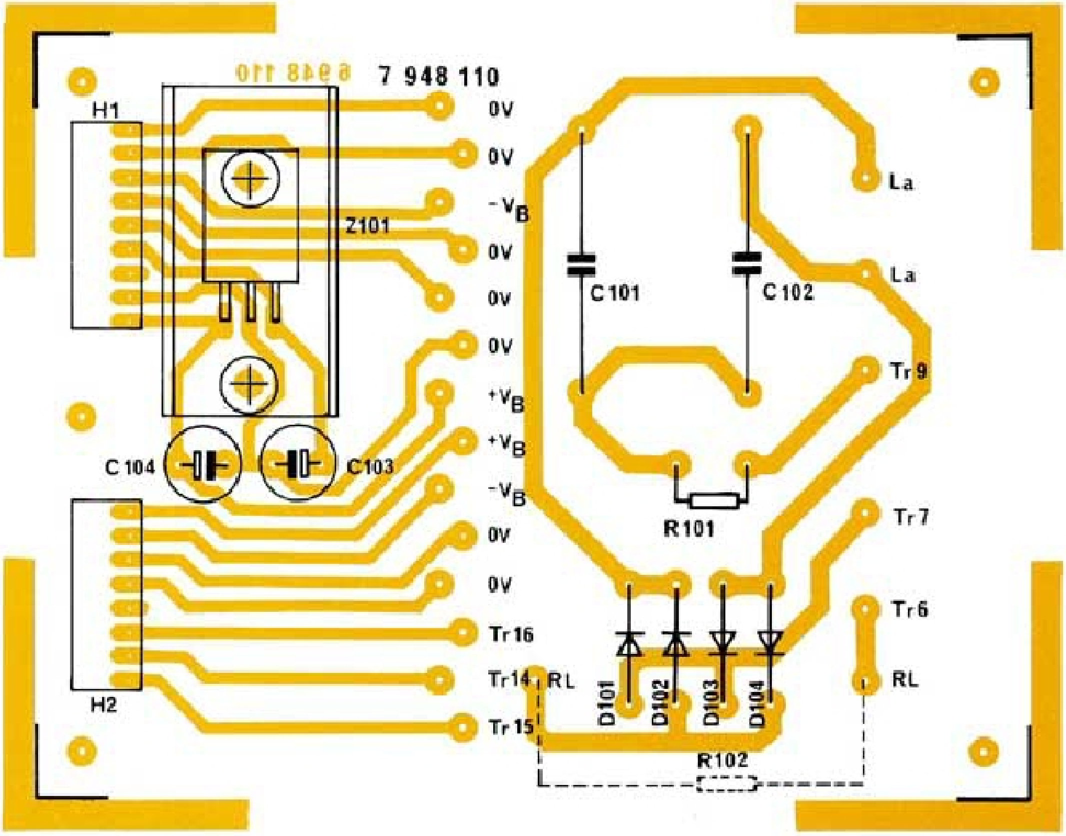
**NF Blockschaltbild EMT 948**
**AUDIO BLOCK DIAGRAM**

*Gegenstecker:
MATING CONNECTOR:
Amphenol 57-30360
(4 203 234)

** Sicht auf Einsteckseite
VIEW ON FRONT SIDE

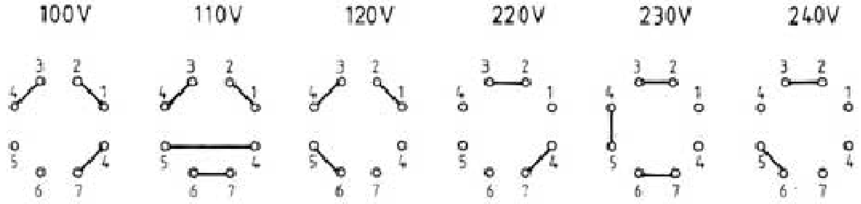
**EMT 9 948 XX1**
**NF-Blockschaltbild**
**AUDIO BLOCK DIAGRAM**

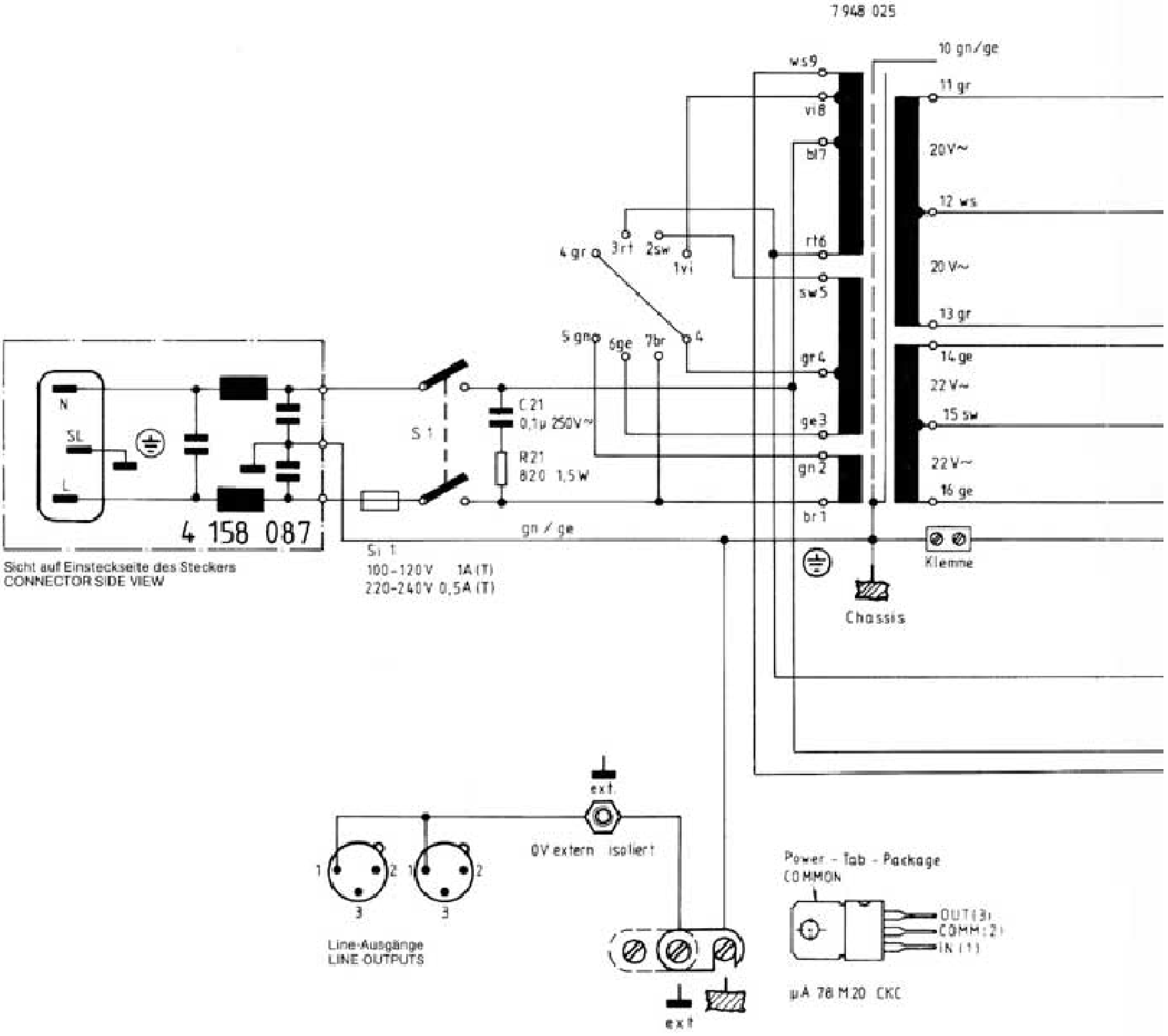
mit Cue-Verstärker siehe Seite 47
with Cue Amplifier see page 47


7 948 110
H1
0V
0V
-V_B
Z101
0V
0V
0V
+V_B
+V_B
-V_B
0V
0V
Tr16
Tr14
Tr15
RL
C 104
C103
H2
La
La
C 101
C 102
Tr 9
R101
Tr 7
Tr 6
RL
D101
D102
D103
D104
R102

**EMT 948**
**Netzteil**
**POWER SUPPLY**

Netzspannungswähler
MAINS VOLTAGE SELECTOR

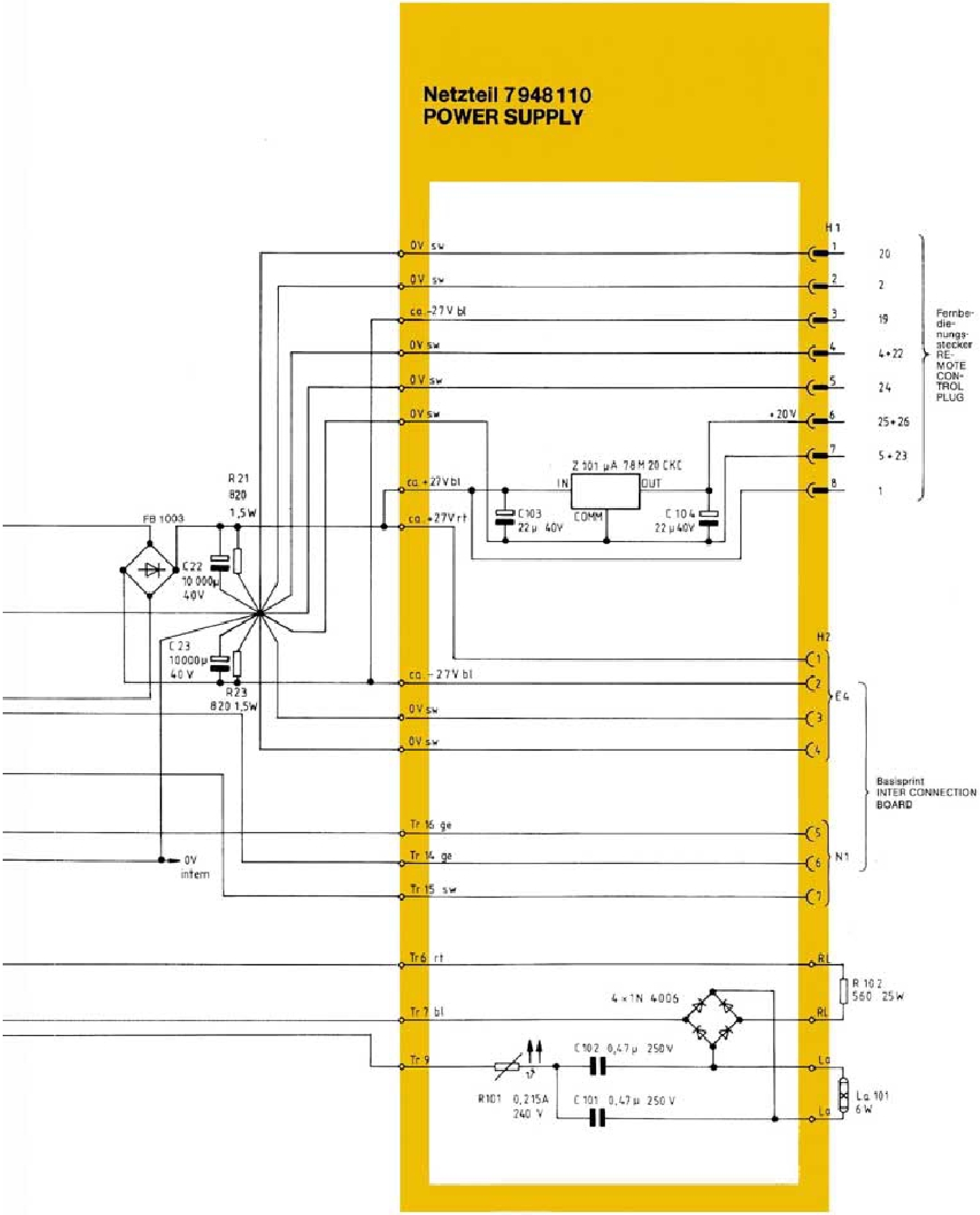

100V
110V
120V
220V
230V
240V
1
2
3
4
5
6
7


7 948 025
10 gn/ge
ws9
vi8
bl7
rt6
sw5
gr4
ge3
gn2
br1
11 gr
20V~
12 ws
20 V~
13 gr
14 ge
22 V~
15 sw
22 V~
16 ge
Klemme
Chassis
4 gr
3 rt
2sw
1vi
5 gn
6ge
7br
4
N
SL
L
4 158 087
S 1
C 21
0,1µ 250V~
R21
820 1,5 W
gn / ge
Si 1
100–120V 1A (T)
220–240V 0,5A (T)
ext.
0V extern isoliert
1
2
3
ext
Power - Tab - Package
COMMON
OUT (3)
COMM (2)
IN (1)
µA 78 M 20 CKC

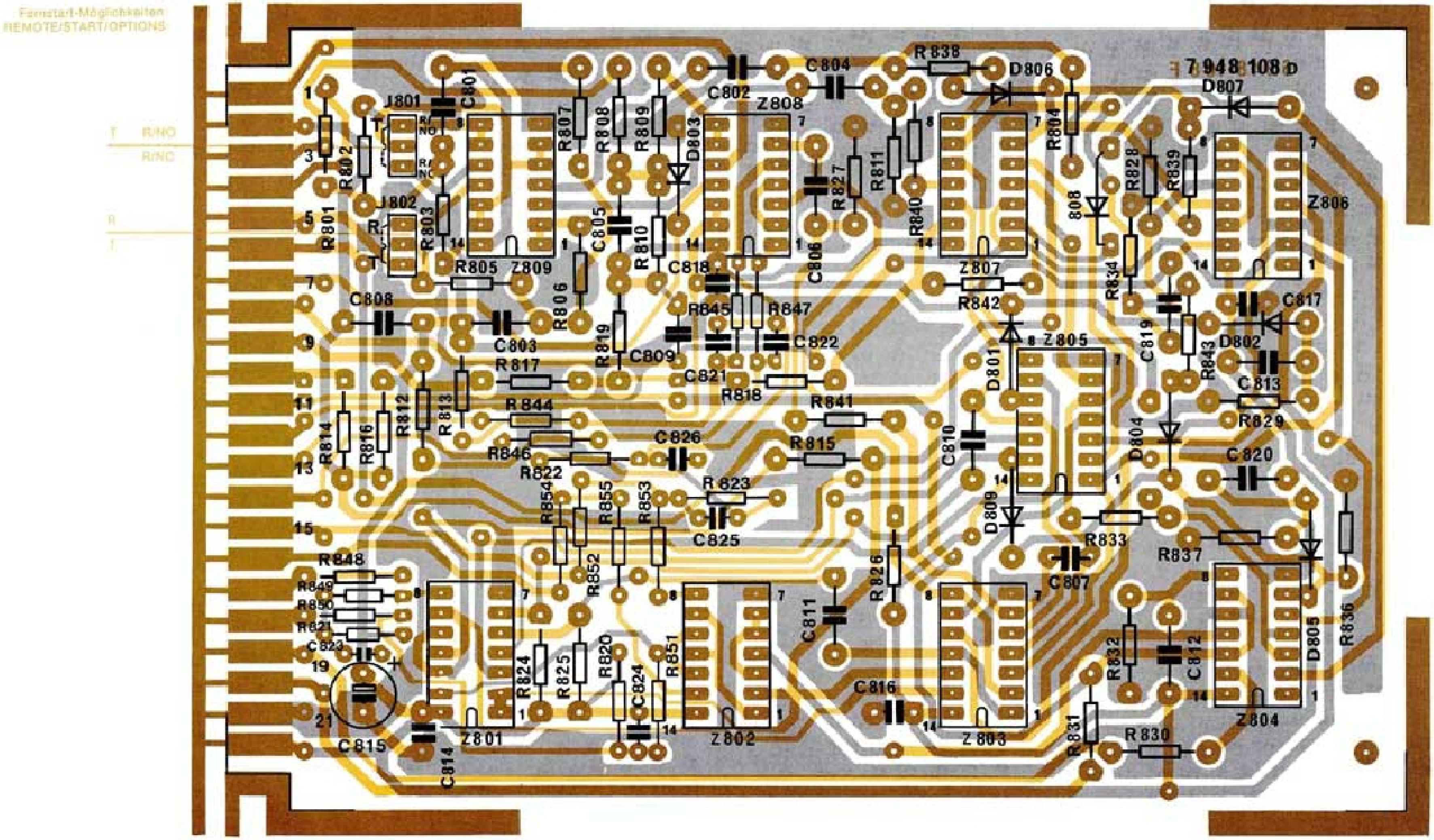
Sicht auf Einsteckseite des Steckers
CONNECTOR SIDE VIEW

Line-Ausgänge
LINE OUTPUTS

# Netzteil 7948110
# POWER SUPPLY



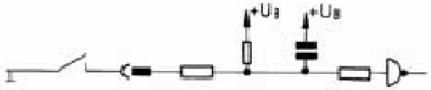
0V sw
0V sw
ca. -27 V bl
0V sw
0V sw
0V sw
ca. +27V bl
ca. +27V rt
ca. -27V bl
0V sw
0V sw
Tr 16 ge
Tr 14 ge
Tr 15 sw
Tr6 rt
Tr 7 bl
Tr 9
H 1
1
2
3
4
5
6
7
8
20
2
19
4+22
24
25+26
5+23
1
+20V
Fernbedienungsstecker
REMOTE CONTROL PLUG
Z 101 µA 78 M 20 CKC
IN
OUT
COMM
C103
22µ 40V
C 104
22µ 40V
R 21
820
1,5W
FB 1003
C22
10 000µ
40V
C 23
10000µ
40 V
R23
820 1,5W
0V
intern
H2
E4
N1
Basisprint
INTER CONNECTION BOARD
RL
RL
R 102
560 25W
4×1N 4006
C 102 0,47µ 250V
C 101 0,47µ 250 V
R101 0,215A
240 V
La
La
La 101
6 W


Fernstart-Möglichkeiten
REMOTE/START/OPTIONS
T R/NO
R/NC
R
T
7 948 108 D
J801
J802
Z801
Z802
Z803
Z804
Z805
Z806
Z807
Z808
Z809
1
3
5
7
9
11
13
15
19
21

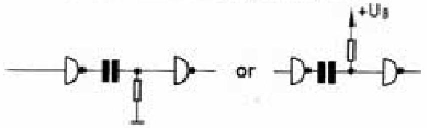
## EMT 948
## INTERFACE

# INTERFACE
7948108

The commands arriving from pushbuttons, switches, and remote control unit are converted into signals required by the control electronics. All connections are activated in the LOW state, i. e., when connected to ground. Open connections are drawn to HIGH by pull-up resistors.



By means of differentiation networks (RC combinations), the Start, Stop, Reverse, and Lift commands produce short impulses only at the moment of switching, causing flipflops to generate the control signals required for the control electronics. The most recently issued command and not (for instance) a continuously depressed button, determines the operating state.



## Remote Control Start/Stop, Fader Start

The Start and Stop functions are switched through two pushbuttons in the Remote Control mode. If these functions are to be initiated by a switch or fader contact, the positions of two programming plugs must be changed:

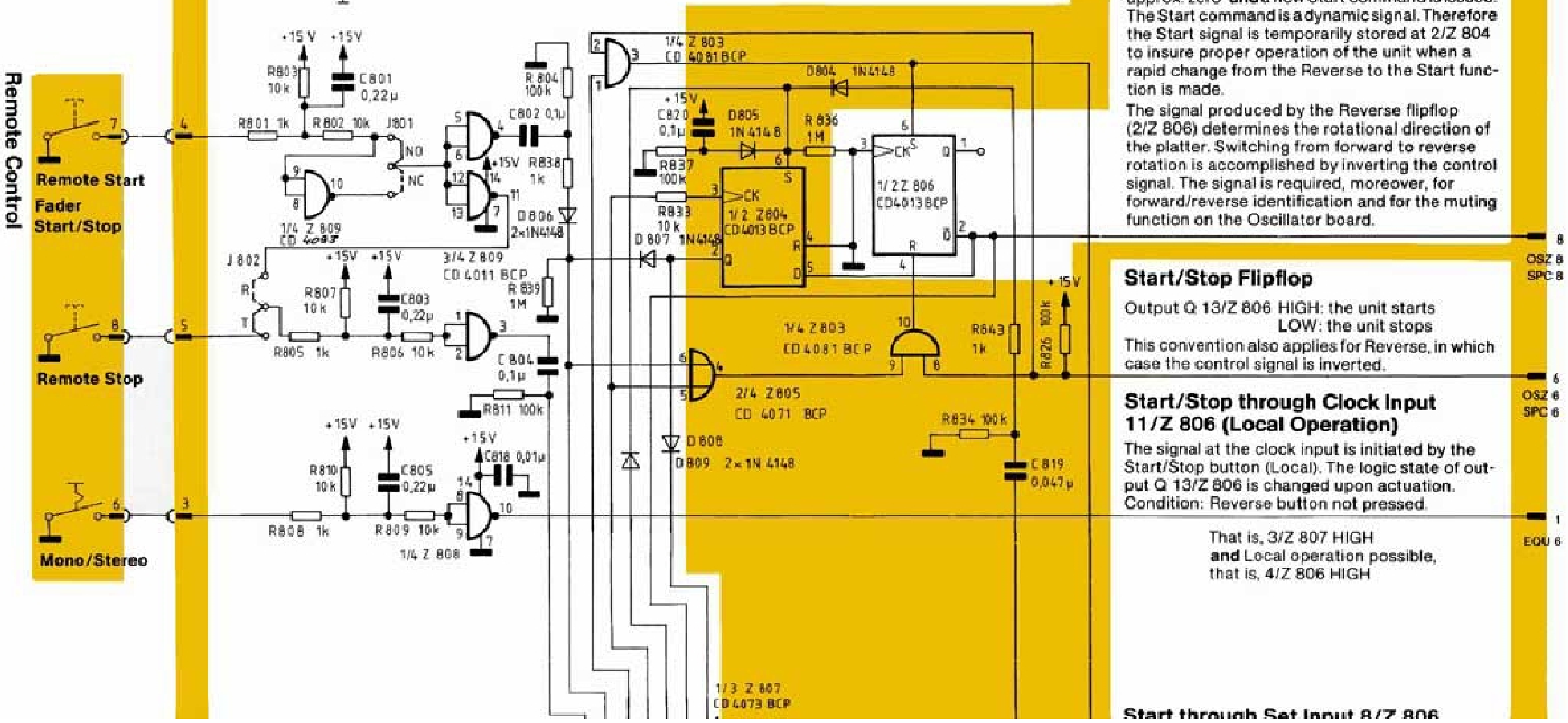
R NO = fader-down contact, normally open
R NC = fader-down contact, normally closed
T NO = pushbutton start (Start/Stop with two pushbuttons)

Switches are to be employed for the Remote Control Only, Local Only, and Mono/Stereo commands. The following modes can be established through the Remote Only and Local Only connections:

| Remote Only | Local Only | |
|---|---|---|
| Input open | Input open | Local and remote control possible |
| 0 V | Input open | Only remote control possible |
| Input open | 0 V | Only local control possible |
| 0 V | 0 V | Operation not possible (can be used to inhibit operation) |

## Reverse Flipflop

The Reverse flipflop is set when the Reverse button has been pressed **and** the speed is approx. zero. (The zero-speed signal is produced by the standstill comparator on the Speed Control Board.)
The Reverse flipflop is reset when the speed is approx. zero **and** a new Start command is issued. The Start command is a dynamic signal. Therefore the Start signal is temporarily stored at 2/Z 804 to insure proper operation of the unit when a rapid change from the Reverse to the Start function is made.
The signal produced by the Reverse flipflop (2/Z 806) determines the rotational direction of the platter. Switching from forward to reverse rotation is accomplished by inverting the control signal. The signal is required, moreover, for forward/reverse identification and for the muting function on the Oscillator board.



Remote Control
Remote Start
Fader
Start/Stop
Remote Stop
Mono/Stereo
7
8
6
4
5
3
R801 1k
R802 10k
R803 10k
C801 0,22µ
+15V
J801
NO
NC
1/4 Z 809
CD 4093
J802
R
T
R805 1k
R806 10k
R807 10k
C803 0,22µ
3/4 Z 809
CD 4011 BCP
R808 1k
R809 10k
R810 10k
C805 0,22µ
1/4 Z 808
C818 0,01µ
R811 100k
C804 0,1µ
R839 1M
R804 100k
C802 0,1µ
R838 1k
D806 2×1N4148
1/4 Z 803
CD 4081 BCP
D804 1N4148
C820 0,1µ
D805 1N4148
R837 100k
R836 1M
R833 10k
D807 1N4148
1/2 Z804
CD4013 BCP
1/2 Z 806
CD4013 BCP
CK
S
R
D
Q
1/4 Z 803
CD 4081 BCP
2/4 Z805
CD 4071 BCP
D808
D809 2×1N 4148
R843 1k
R826 100k
R834 100k
C819 0,047µ
1/3 Z 807
CD 4073 BCP
8
OSZ 8
SPC 8
6
OSZ 6
SPC 6
1
EQU 6

## Start/Stop Flipflop

Output Q 13/Z 806 HIGH: the unit starts
LOW: the unit stops

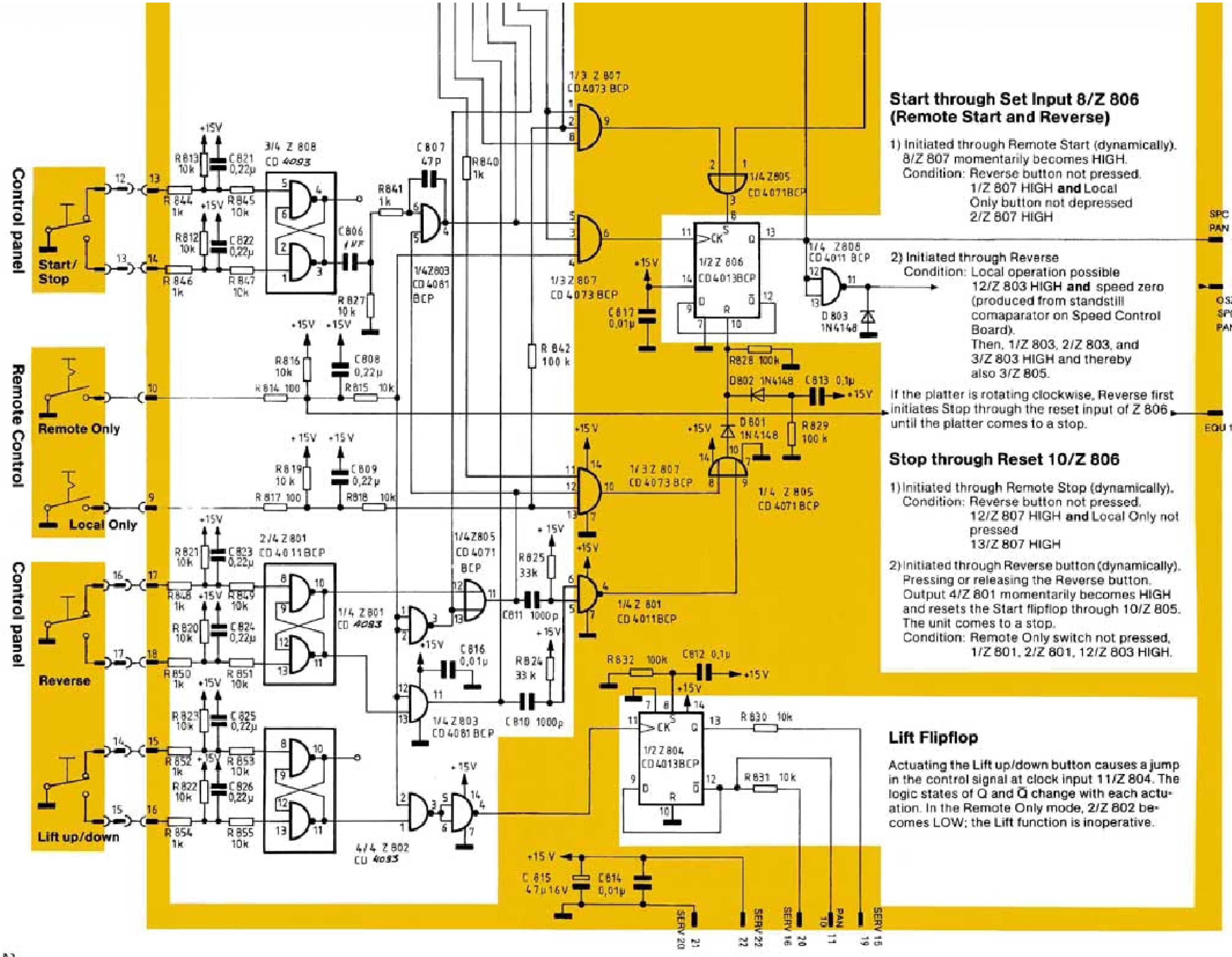
This convention also applies for Reverse, in which case the control signal is inverted.

## Start/Stop through Clock Input 11/Z 806 (Local Operation)

The signal at the clock input is initiated by the Start/Stop button (Local). The logic state of output Q 13/Z 806 is changed upon actuation. Condition: Reverse button not pressed.

That is, 3/Z 807 HIGH
**and** Local operation possible,
that is, 4/Z 806 HIGH

## Start through Set Input 8/Z 806


Control panel
Start/ Stop
Remote Control
Remote Only
Local Only
Control panel
Reverse
Lift up/down
3/4 Z 808 CD 4093
1/3 Z 807 CD4073 BCP
1/4 Z805 CD4071BCP
1/2 Z 806 CD4013BCP
1/4 Z808 CD4011 BCP
D 803 1N4148
D802 1N4148
D 801 1N4148
1/4Z803 CD 4081 BCP
1/3 Z 807 CD 4073 BCP
1/4 Z 805 CD 4071 BCP
1/4 Z 801 CD 4011BCP
2/4 Z 801 CD 40 11 BCP
1/4 Z 801 CD 4093
1/4Z805 CD 4071 BCP
1/4 Z 803 CD 40 81 BCP
4/4 Z 802 CU 4093
1/2 Z 804 CD4013BCP
C 815 47µ 16V
C 814 0,01µ
SPC 13
PAN 11
12
7
OSZ 7
SPC 7
PAN 9
2
EQU 15
SERV 20
21
22
SERV 22
SERV 16
20
PAN 10
11
SERV 15
19

## Start through Set Input 8/Z 806 (Remote Start and Reverse)

1) Initiated through Remote Start (dynamically). 8/Z 807 momentarily becomes HIGH.
Condition: Reverse button not pressed.
1/Z 807 HIGH **and** Local Only button not depressed
2/Z 807 HIGH

**2) Initiated through Reverse**
Condition: Local operation possible
12/Z 803 HIGH **and** speed zero (produced from standstill comaparator on Speed Control Board).
Then, 1/Z 803, 2/Z 803, and 3/Z 803 HIGH and thereby also 3/Z 805.

If the platter is rotating clockwise, Reverse first initiates Stop through the reset input of Z 806 until the platter comes to a stop.

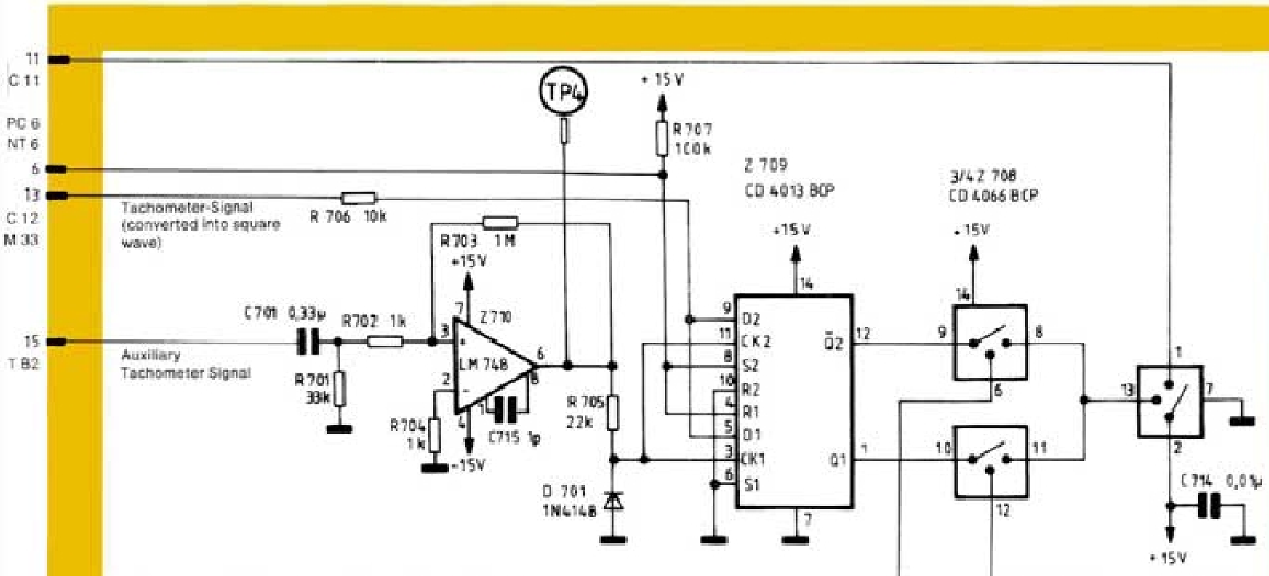
## Stop through Reset 10/Z 806

1) Initiated through Remote Stop (dynamically).
Condition: Reverse button not pressed.
12/Z 807 HIGH **and** Local Only not pressed
13/Z 807 HIGH

2) Initiated through Reverse button (dynamically). Pressing or releasing the Reverse button. Output 4/Z 801 momentarily becomes HIGH and resets the Start flipflop through 10/Z 805. The unit comes to a stop.
Condition: Remote Only switch not pressed.
1/Z 801, 2/Z 801, 12/Z 803 HIGH.

## Lift Flipflop

Actuating the **Lift** up/down button causes a jump in the control signal at clock input 11/Z 804. The logic states of Q and Q̄ change with each actuation. In the Remote Only mode, 2/Z 802 becomes LOW; the **Lift** function is inoperative.


11
C 11
PC 6
NT 6
6
13
C 12
M 33
15
T B2
Tachometer-Signal (converted into square wave)
R 706 10k
Auxiliary Tachometer Signal
C 701 0,33µ
R 702 1k
R 701 33k
R 703 1M
+15V
Z 710
LM 748
R 704 1k
C 715 1p
-15V
R 705 22k
D 701 1N4148
TP4
+15V
R 707 100k
Z 709
CD 4013 BCP
+15V
D2
CK2
S2
R2
R1
D1
CK1
S1
$\overline{Q}2$
Q1
3/4 Z 708
CD 4066 BCP
+15V
C 714 0,01µ
+15V

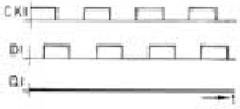
## Forward/Reverse Identification

The forward/reverse identification prevents uncontrolled acceleration of the turntable platter opposite to the selected direction. This function is implemented with two identically constructed tachometer generators, the phases of which differ by 90° by reason of their physical location.

### Forward Operation (Start pressed)

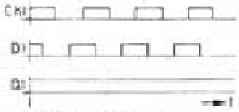
Pin 12/Z 708 HIGH, switch closed.
Pin 6/Z 708 LOW, switch open.
Tachometer signal (square wave) at D 1 5/Z 709.
Auxiliary tachometer signal (square wave) Ck 1 3/Z 709.

a) Normal case: Start pressed, platter rotates forward.



Q 1 1/Z 709 remains LOW. The analog switch with pins 1 — 2/Z 708 remains open.

b) Start pressed. Platter is rotated backwards by hand during cueing.



Q 1 1/Z 709 becomes HIGH. Approx. + 15 V lie at 1/Z 708. This signal causes a braking signal to be produced on the Speed Control Board until the platter stops and then rotates in a forward direction.

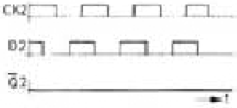
### Reverse Operation (Reverse pressed)

Pin 12/Z 708 LOW, switch open.
Pin 6/Z 708 HIGH, switch closed.

Forward/reverse identification occurs through output $\overline{Q}2$ 12/Z 709.

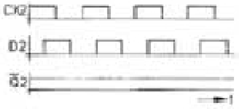
- Tachometer signal appears at data input D 2 (pin 9/Z 709).
- Auxiliary tachometer signal appears at clock input Ck 2 (pin 11/Z 709).

a) Normal case: Reverse pressed, platter rotates backwards.

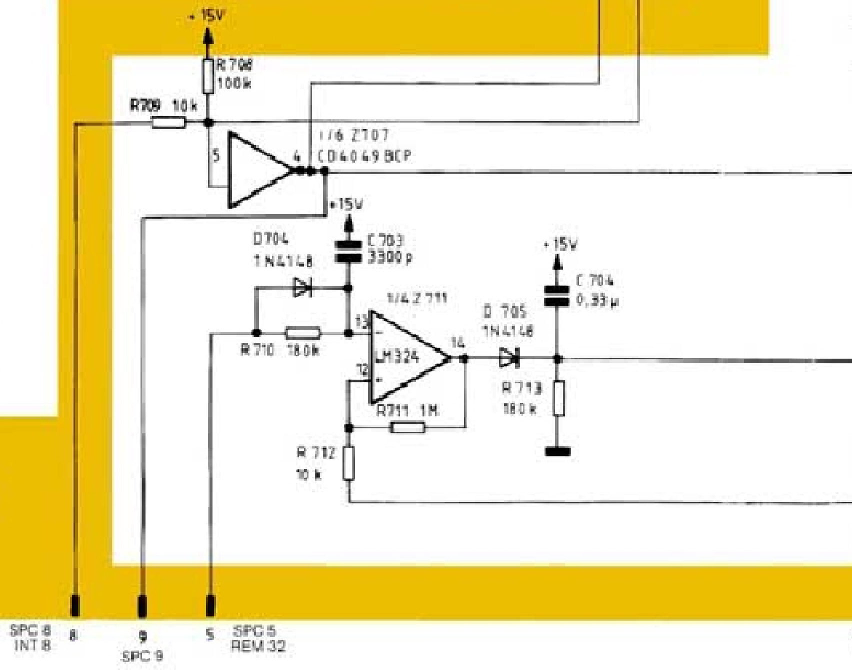

CK2
D2
$\overline{Q}2$
t

$\overline{Q}2$ LOW. The analog switch with pins 1 — 2/Z 708 remains open.

b) Reverse pressed. Platter is forcefully rotated forwards.


CK2
D2
$\overline{Q}2$
t

$\overline{Q}2$ HIGH. Approx. + 15 V at 1/Z 708. This signal causes a braking signal to be produced on the Speed Control Board until the platter stops and then rotates in the reverse direction.


+15V
R 708 100k
R709 10k
5
4
1/6 Z 707
CD 4049 BCP
+15V
D 704 1N4148
C 703 3300 p
1/4 Z 711
LM324
R 710 180k
R 711 1M
R 712 10 k
+15V
C 704 0,33µ
D 705 1N4148
R 713 180 k
SPC 8
INT 8
8
9
SPC 9
5
SPC 5
REM 32

## Oszillatorplatine 7948107
## OSCILLATOR

Mut

Durir
In or
Cont

Pin 2
Pin 3

The
– th
o
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o
– ar
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fr

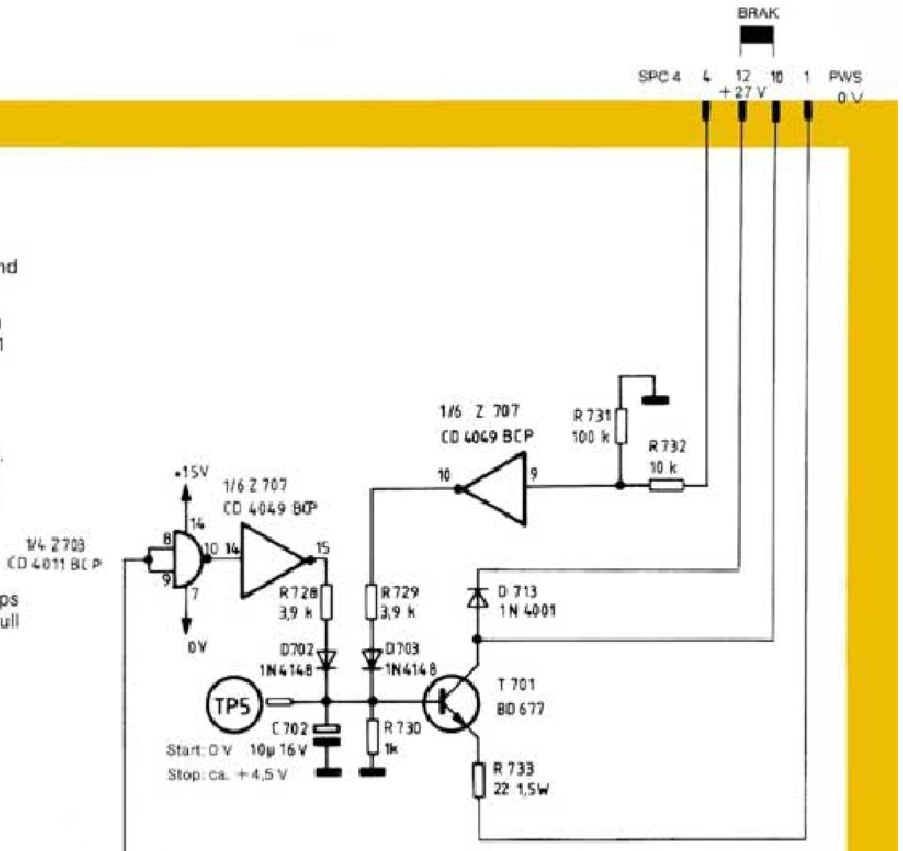
## Brake

The brake coil is connected between pins 12 and 10 of the Oscillator Board.

When T 701 conducts, a current flows through the brake coil. The brake engages. When T 701 is cut off, the brake is released.

The brake is engaged in two stages. Normal operation, Stop is pressed:

- Output 15/Z 707 jumps from LOW to HIGH. Output 10/Z 707 remains LOW. Capacitor C 702 charges, the base of transistor T 701 becomes slightly positive. T 701 begins to conduct, the brake is lightly engaged.
- At zero rotational speed, 10/Z 707 also jumps to HIGH, transistor T 701 is conducting, the full braking force is applied.


BRAK
SPC 4
4
12
+27 V
10
1
PWS
0 V
1/6 Z 707
CD 4049 BCP
10
9
R 731
100 k
R 732
10 k
+15 V
1/6 Z 707
CD 4049 BCP
14
15
1/4 Z 703
CD 4011 BCP
8
9
10
14
7
0 V
R 728
3,9 k
R 729
3,9 k
D 713
1 N 4001
D702
1N4148
D703
1N4148
TP5
T 701
BD 677
C 702
10µ 16 V
R 730
1k
Start: 0 V
Stop: ca. +4,5 V
R 733
22 1,5W

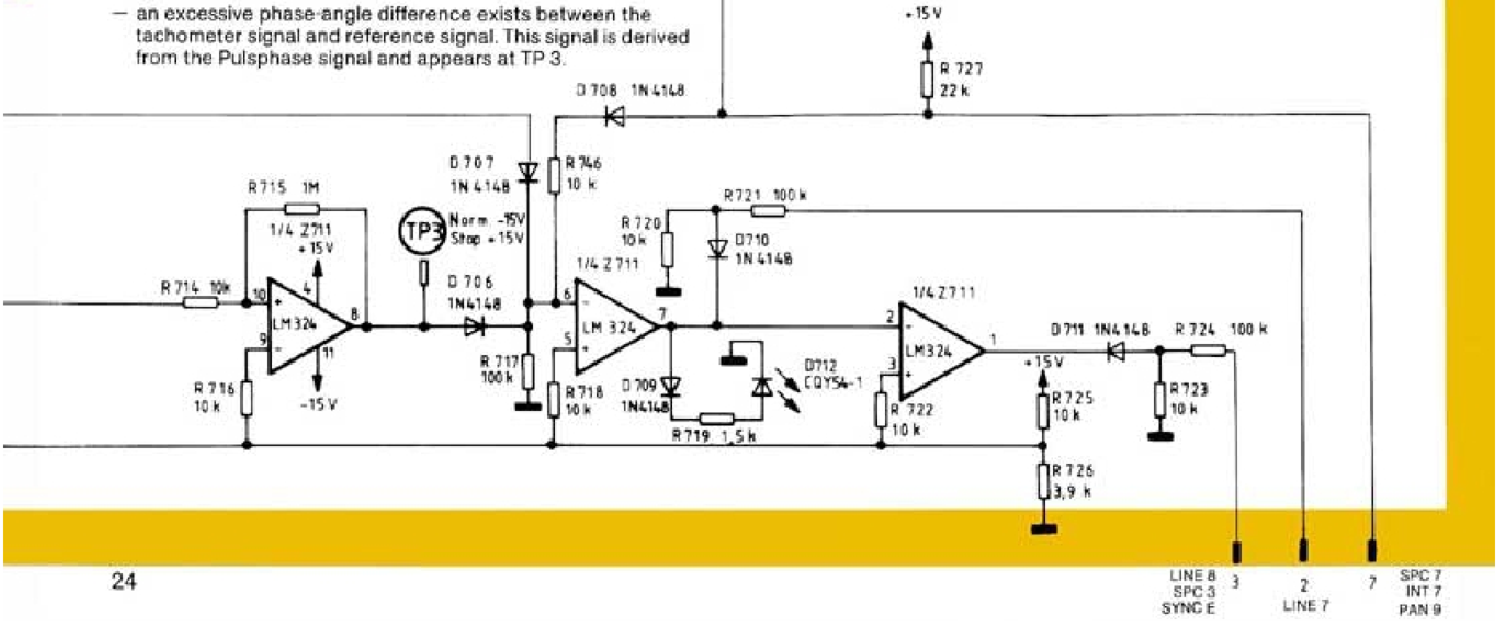
## Muting during the Start and Stop Phases

During the Start and Stop phases, the line outputs are muted. In order to improve run-up performances, C 606 (on the Speed Control Board) is shorted during this interval.

**Pin 2** of the Oscillator Board: Mute: −15 V, otherwise 0 V
**Pin 3** of the Oscillator Board: Mute: 0 V, otherwise − 15 V

The muting function is initiated when:

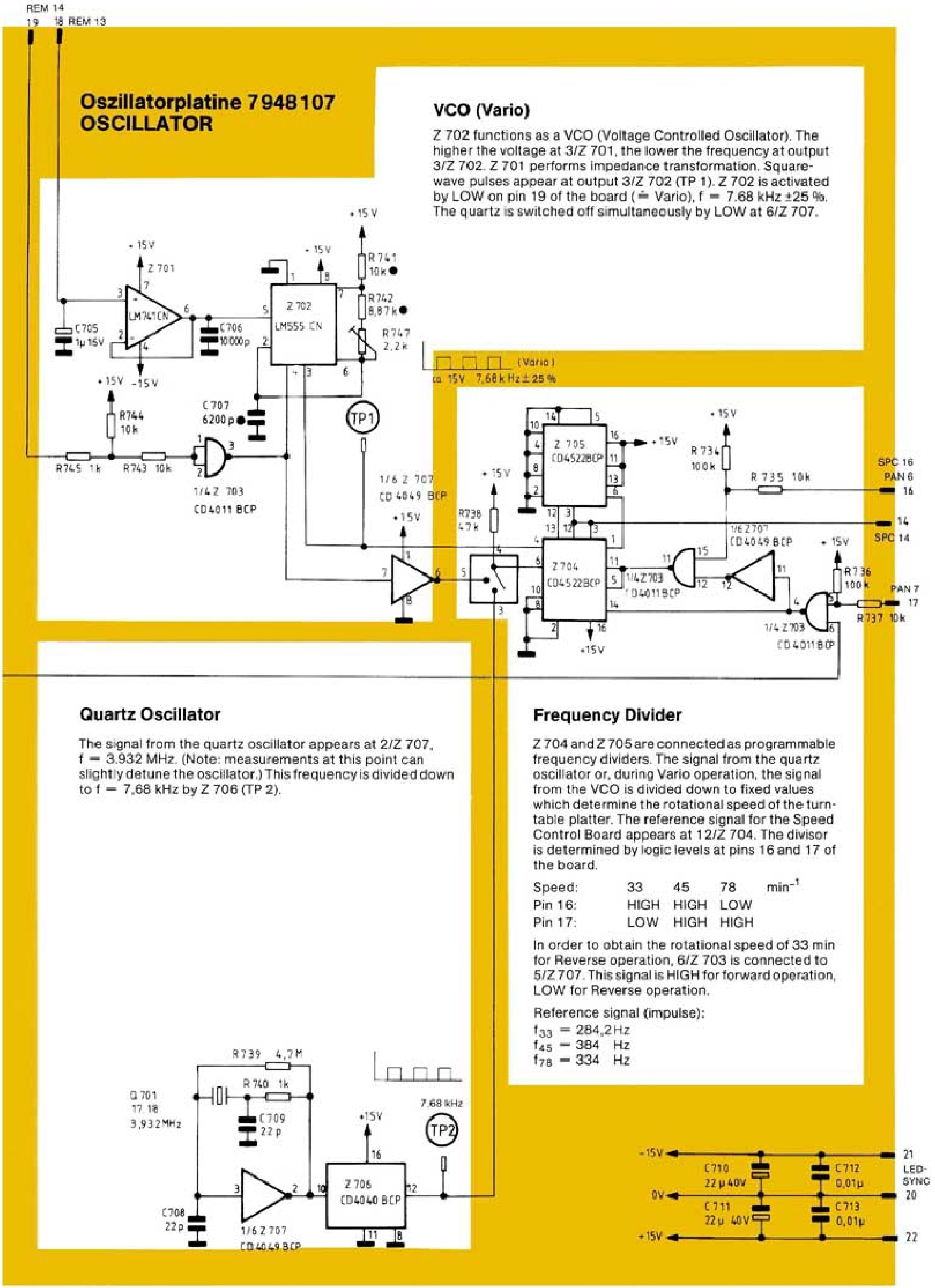
- the Stop button is pressed. Pin 8 of the board LOW,
  or
- the Reverse button is pressed. Pin 8 of the board LOW,
  or
- an excessive phase-angle difference exists between the tachometer signal and reference signal. This signal is derived from the Pulsphase signal and appears at TP 3.


+15 V
R 727
22 k
D 708 1N 4148
D 707
1N 4148
R 746
10 k
R715 1M
1/4 Z711
+15 V
4
TP3
Norm. -15V
Stop +15V
R 721 100 k
R 720
10 k
D 710
1N 4148
1/4 Z 711
R 714 10k
10
LM 324
8
9
11
-15 V
D 706
1N4148
6
5
LM 324
7
1/4 Z 711
2
3
LM 324
1
D 711 1N 4148
R 724 100 k
+15 V
R 716
10 k
R 717
100 k
R 718
10 k
D 709
1N4148
D712
CQY54-1
R 722
10 k
R 725
10 k
R 723
10 k
R 719 1,5 k
R 726
3,9 k
LINE 8
SPC 3
SYNC E
3
2
LINE 7
7
SPC 7
INT 7
PAN 9

# Oszillatorplatine 7 948 107
# OSCILLATOR

## VCO (Vario)

Z 702 functions as a VCO (Voltage Controlled Oscillator). The higher the voltage at 3/Z 701, the lower the frequency at output 3/Z 702. Z 701 performs impedance transformation. Square-wave pulses appear at output 3/Z 702 (TP 1). Z 702 is activated by LOW on pin 19 of the board (≙ Vario), f = 7.68 kHz ±25 %. The quartz is switched off simultaneously by LOW at 6/Z 707.


REM 14
19
18 REM 13
+15V
Z 701
LM741CN
C 705 1µ 16V
C 706 10000 p
-15V
Z 702
LM555 CN
R 741 10k
R 742 8,87k
R 747 2,2k
TP1
R 744 10k
C 707 6200 p
R 745 1k
R 743 10k
1/4 Z 703
CD 4011 BCP
1/6 Z 707
CD 4049 BCP
R 738 47k
(Vario)
ca. 15V 7,68 kHz ± 25 %
Z 705
CD 4522 BCP
Z 704
CD 4522 BCP
R 734 100k
R 735 10k
SPC 16
PAN 6
16
14
SPC 14
1/6 Z 707
CD 4049 BCP
1/4 Z 703
CD 4011 BCP
R 736 100k
PAN 7
17
R 737 10k
1/4 Z 703
CD 4011 BCP
R 739 4,7M
R 740 1k
Q 701 17.18 3,932 MHz
C 709 22 p
C 708 22 p
1/6 Z 707
CD 4049 BCP
Z 706
CD 4040 BCP
7,68 kHz
TP2
-15V
0V
+15V
C 710 22µ 40V
C 711 22µ 40V
C 712 0,01µ
C 713 0,01µ
21
LED-SYNC
20
22

## Quartz Oscillator

The signal from the quartz oscillator appears at 2/Z 707, f = 3.932 MHz. (Note: measurements at this point can slightly detune the oscillator.) This frequency is divided down to f = 7.68 kHz by Z 706 (TP 2).

## Frequency Divider

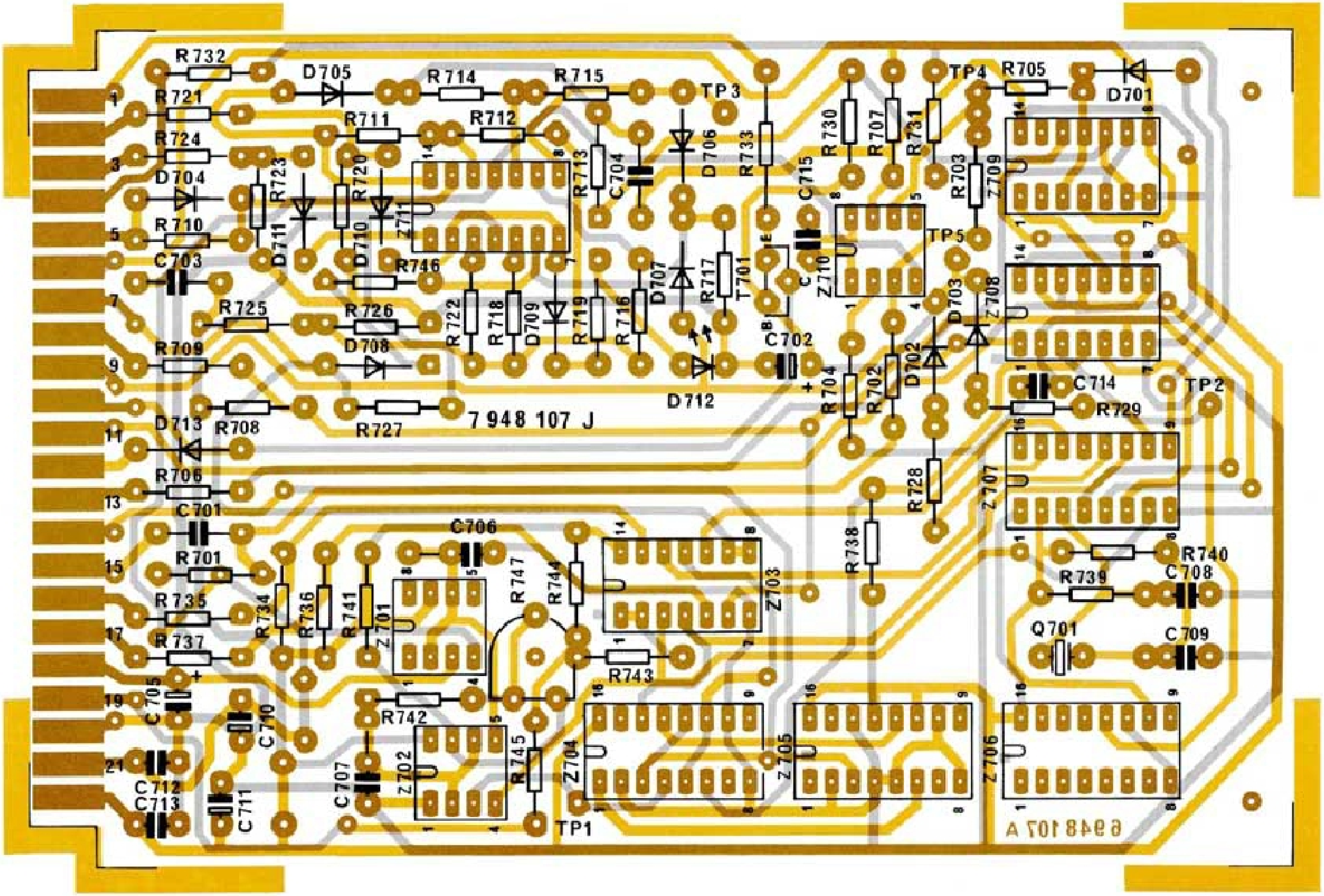
Z 704 and Z 705 are connected as programmable frequency dividers. The signal from the quartz oscillator or, during Vario operation, the signal from the VCO is divided down to fixed values which determine the rotational speed of the turntable platter. The reference signal for the Speed Control Board appears at 12/Z 704. The divisor is determined by logic levels at pins 16 and 17 of the board.

| Speed: | 33 | 45 | 78 | $\text{min}^{-1}$ |
|---|---|---|---|---|
| Pin 16: | HIGH | HIGH | LOW | |
| Pin 17: | LOW | HIGH | HIGH | |

In order to obtain the rotational speed of 33 min for Reverse operation, 6/Z 703 is connected to 5/Z 707. This signal is HIGH for forward operation, LOW for Reverse operation.

Reference signal (impulse):

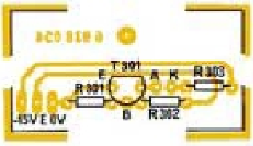
$f_{33}$ = 284,2 Hz
$f_{45}$ = 384 Hz
$f_{78}$ = 334 Hz


R732
D705
R714
R715
TP3
TP4
R705
D701
R721
R711
R712
R724
R713
C704
D706
R733
R730
R707
R731
R703
Z709
D704
R723
R720
Z711
C715
TP5
R710
D711
D710
R746
D707
R717
T701
Z710
C703
R725
R726
R722
R718
D709
R719
R716
D703
Z708
D708
C702
R704
R702
D702
R709
D712
C714
TP2
R729
R708
R727
7 948 107 J
D713
R706
Z707
R728
C701
C706
R738
R701
R747
R744
Z703
R740
R735
R734
R736
R741
Z701
R739
C708
R737
R743
Q701
C709
C705
C710
R742
Z704
Z705
Z706
C712
C713
C711
C707
Z702
R745
TP1
6 948 107 A
1
3
5
7
9
11
13
15
17
19
21

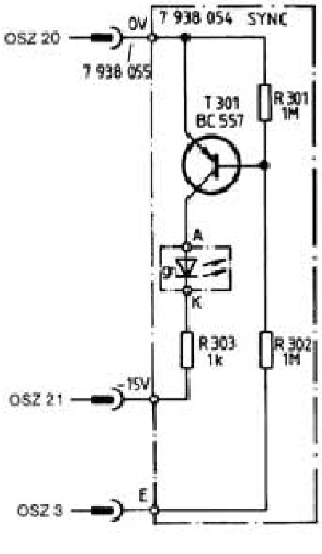
EMT 948
OSCILLATOR

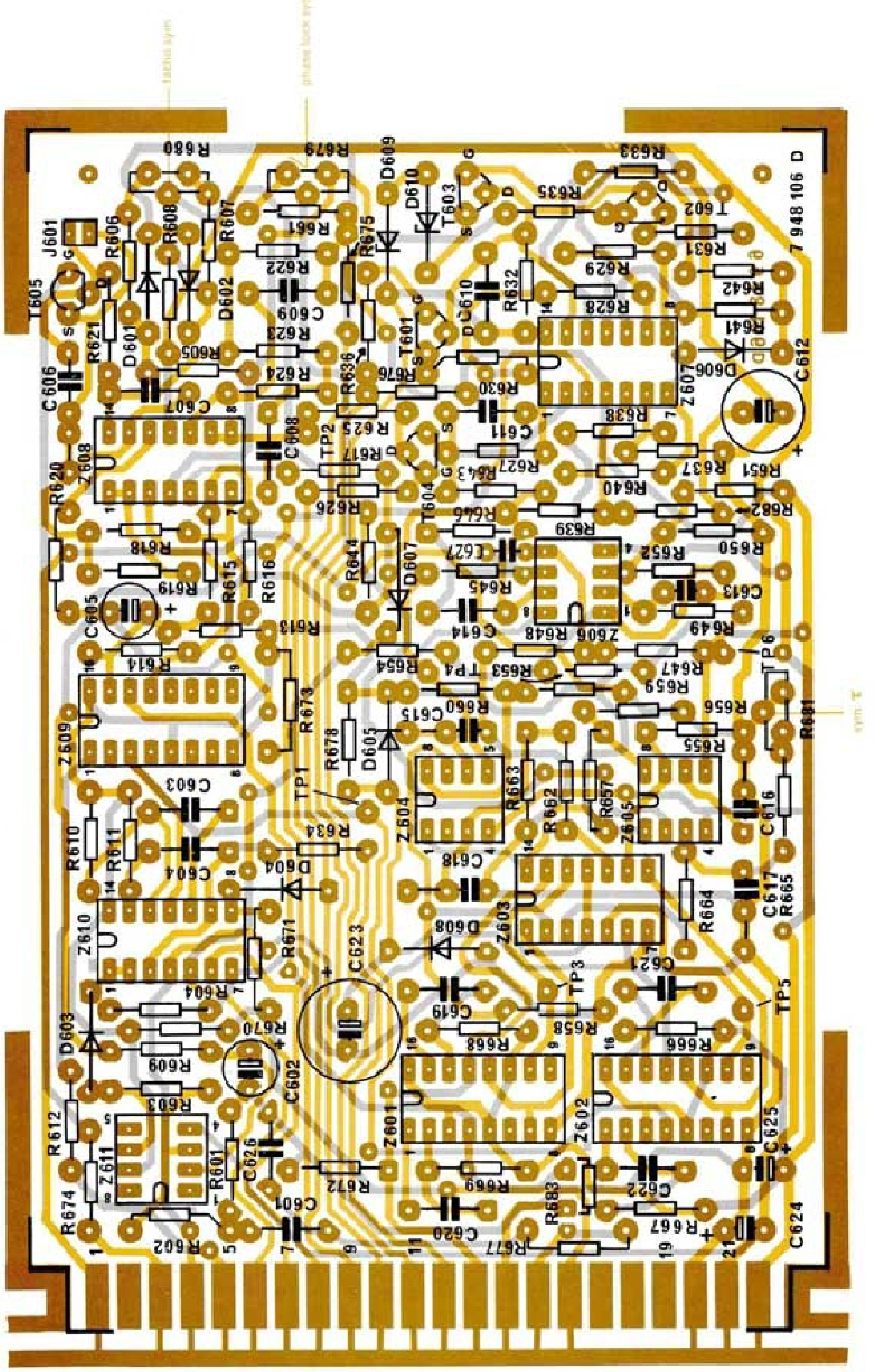
## LED SYNC Indicator

Muting Signal OSC 3 is used for driving the SYNC indicator LED. It is fed to the base of T 301 (on the SYNC board 7 938 054). The LED at the rim of the turntable therefore illuminates when the tachometer signal is in phase with the reference signal.


T 301
E
A
K
R 303
R 301
B
R 302
-15V E 0V

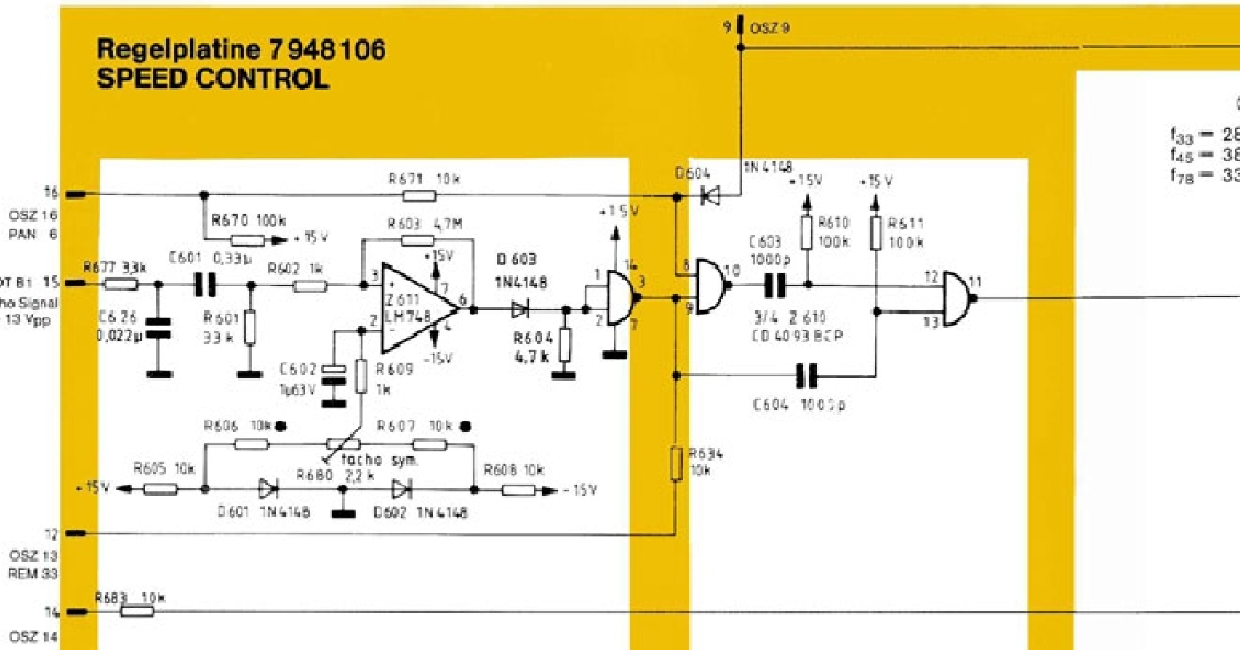
**Sync-Anzeige**
**SYNC INDICATOR**
**7 938 054**


OSZ 20
0V
/
7 938 055
7 938 054 SYNC
T 301
BC 557
R 301
1M
A
gn
K
R 303
1k
R 302
1M
-15V
OSZ 21
E
OSZ 3


tacho sym
phase lock sym
sym. T
7 948 106 D
R680
R679
R633
R635
R631
R629
R628
R642
R641
R632
T602
T603
D609
D610
D606
C612
Z607
R638
R637
R651
R640
R682
R650
R652
R639
C613
R649
Z606
R648
R647
TP6
R681
R656
R655
R659
R653
TP4
R660
C615
R654
C614
R645
C627
R646
R643
R627
C611
R630
C610
T601
T604
D607
R644
R675
R661
R622
C609
R623
R624
R636
R676
R625
TP2
R617
R626
C608
C607
Z608
R605
D601
D602
R606
R608
R607
J601
T605
R621
C606
R620
R618
R619
R615
R616
C605
R613
R614
R673
Z609
R678
D605
TP1
C603
R610
R611
C604
R634
D604
Z604
R663
R662
R657
Z605
C616
C618
Z603
C617
R665
R664
D608
C623
R671
Z610
R604
R670
D603
R609
C602
R603
C621
TP3
TP5
C619
R658
R668
R666
Z601
Z602
C625
R612
Z611
R601
C626
R672
R669
R683
C622
R674
R602
C601
C620
R677
R667
C624
1
5
7
9
11
19
21

## EMT 948
## Regelplatine
## SPEED CONTROL

## Regelplatine 7 948 106
## SPEED CONTROL


16
OSZ 16
PAN 6
MOT 81 15
Tacho Signal
12 - 13 Vpp
R677 3,3k
C626 0,022µ
C601 0,33µ
R601 3,3 k
R602 1k
R670 100k
+15V
R671 10k
R603 4,7M
Z 611
LH748
+15V
-15V
C602 1µ63V
R609 1k
D 603
1N4148
R604 4,7 k
+15V
R606 10k
R607 10k
tacho sym.
R680 2,2 k
R605 10k
R608 10k
D601 1N4148
D602 1N4148
12
OSZ 13
REM 33
R683 10k
14
OSZ 14
9
OSZ 9
D604
1N4148
R610 100k
R611 100k
C603 1000p
3/4 Z 610
CD 4093 BCP
C604 1000p
R634 10k

### Tacho-Signal-Umformung

Z 611 ist als Schmitt-Trigger geschaltet. Das sinusförmige Tacho-Signal wird in ein Rechteck-Signal mit dem Tastverhältnis 1 : 1 umgewandelt, negative Signalanteile werden mit D 603 kurzgeschlossen. Das Tastverhältnis wird mit R 680 eingestellt.

Die Einstellung erfolgt so, daß nach der F/U-Wandlung des Tacho-Signals eine minimale Treppenspannung entsteht (Anschl. 1 der Platine, siehe unten).

**Tachosignal (Anschluß 15):**

$f_{33}$ = 142,2 Hz
$f_{45}$ = 192 Hz
$f_{78}$ = 334 Hz

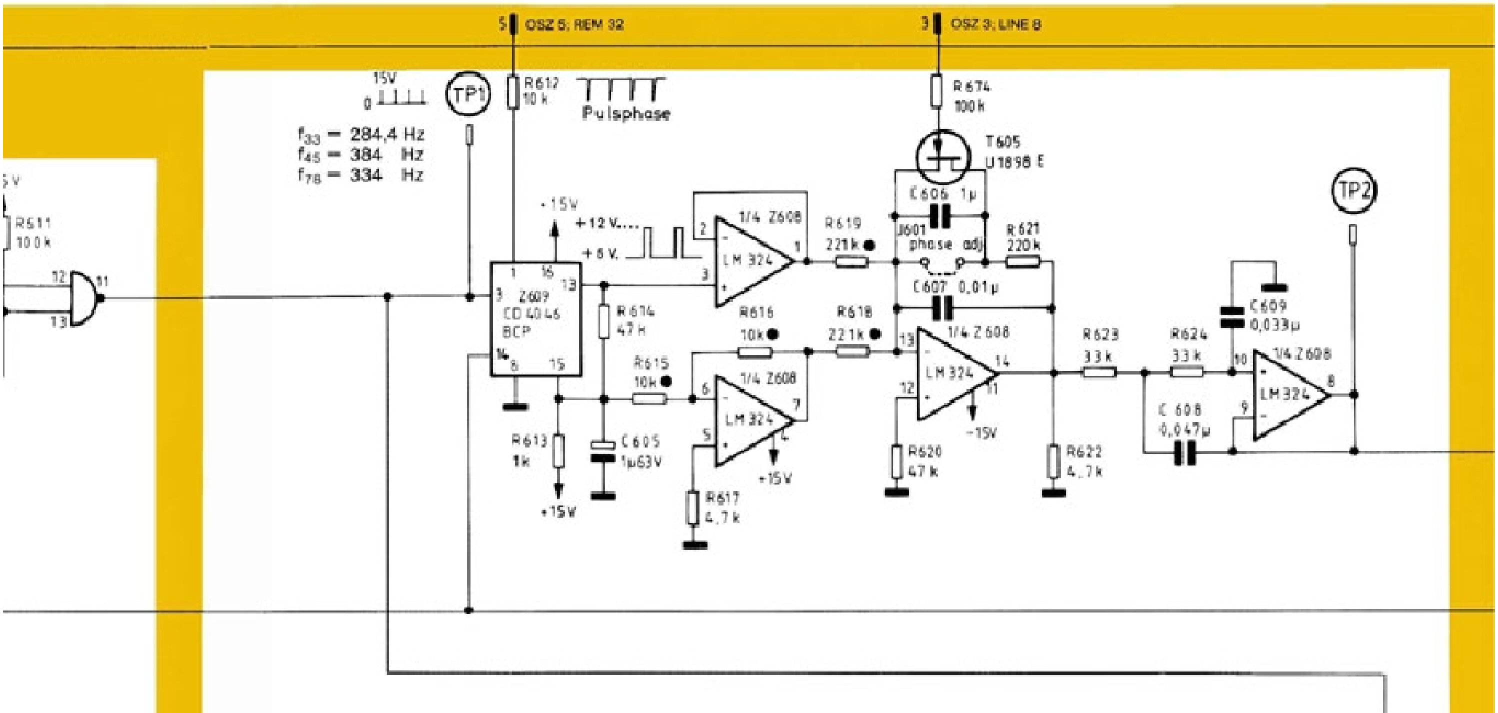
### Frequenzverdopplung

An Ausgang 11/Z 610 liegen Nadelimpulse (TP 1) der doppelten Tachofrequenz bei den Geschwindigkeiten 33 und 45 min$^{-1}$. Bei 78 min$^{-1}$ ist die Frequenz der Impulse gleich der Tachofrequenz (Eingang 8/Z 610 = "0"). Die Pulsdauer wird durch die RC-Glieder C 603, R 610 und C 604, R 611 bestimmt.

$f_{33}$ = 28
$f_{45}$ = 38
$f_{78}$ = 33

### R 680 (tacho sym.)

- Maschine abschalten.
- Regelplatine auf Verlängerungsprint setzen.
- Maschine einschalten. Geschwindigkeit 33 1/3 wählen.
- An Anschluß 1 der Platine oder Anschluß 31 des Fernbedienungssteckers (F/U-Information) Oszilloskop anschließen (y = 10 mV/div; x = 2 ms/div). Dabei hochohmigen, kapazitätsarmen Tastkopf verwenden, da sonst unter Umständen HF-Einstreuungen auftreten.
- Start drücken.
- Mit R 680 (tacho sym.) minimale Sägezahn-Amplitude einstellen, <20 $mV_{pp}$


5 OSZ 5; REM 32
3 OSZ 3; LINE 8
15V
0
TP1
R 612
10 k
Pulsphase
$f_{33}$ = 284,4 Hz
$f_{45}$ = 384 Hz
$f_{78}$ = 334 Hz
5 V
R 611
100 k
12
13
11
+15 V
+12 V....
+6 V.
1
16
13
3
Z 609
CD 4046
BCP
14
8
15
R 614
47 k
R 615
10 k ●
R 613
1 k
C 605
1µ63V
+15 V
R 617
4,7 k
1/4 Z 608
LM 324
2
3
1
6
5
7
4
+15V
R 616
10 k ●
R 619
221 k ●
R 618
221 k ●
R 674
100 k
T 605
U 1898 E
C 606 1µ
J601
phase adj
R 621
220 k
C 607 0,01µ
13
12
14
11
-15V
R 620
47 k
R 622
4,7 k
R 623
33 k
R 624
33 k
C 609
0,033µ
C 608
0,047µ
10
9
8
TP2

## …opplung

…310 liegen Nadel-
…doppelten Ta-
…en Geschwin-
…5 min⁻¹. Bei
…equenz der Im-
…chofrequenz
… = "0"). Die Puls-
…ile RC-Glieder
…C 604, R 611 be-

## Phasenvergleich und Loop-Filter

Z 609 ist als Phasenvergleicher geschaltet. Referenzsignal (heruntergeteilte Oszillatorfrequenz) und Signal von 11/Z 610 erzeugen eine von ihrem Phasenunterschied abhängige Spannung an 13/Z 609. Diese Spannung beträgt ca. + 7,5 V; ihr werden Pulse von ± 7,5 V je nach positivem bzw. negativem Phasenunterschied überlagert. Die Dauer dieser Impulse wird vom Betrag des Phasenwinkels bestimmt.

In der nachfolgenden Schaltung wird eine Gleichspannung von ca. 7,5 V vom Signal des Phasenvergleichers subtrahiert.

An 1/Z 609 steht das Signal "Pulsphase" zur Verfügung. Es entspricht dem Betrag des Signals an 13/Z 609.

## Loop-Filter (Schleifenfilter)

Z 608 mit dem Ausgang 14 ist als Integrator geschaltet. Zur Verbesserung des Hochlaufverhaltens ist C 606 während der Hochlaufphase kurzgeschlossen.

Tiefpaß 2. Ordnung: zum Abbau der Restwelligkeit des Signals an 14/Z 608.

An Ausgang 8/Z 608 (Testpunkt 2) liegt das Regelsignal der PLL-Schaltung.

## Achtung!

In den Geräten Nr. 44 151 bis Nr. 44 180 ist das Potentiometer R 681 (sym.$\tau$) nicht eingebaut. Dies hat zur Folge, daß bei Stillstand (Stop) der Maschine ein kleines Moment auf den Plattenteller wirken kann. Diese Maschinen werden für den Betrieb mit R 679 (phase lock sym.) abgeglichen.

## R 679 (phase lock sym.)

- Maschine abschalten.
- Regelplatine auf Verlängerungsprint setzen. Jumper J 601 kurzschließen.
- Oszilloskop an Anschluß 5 der Platine (Signal Pulsphase) oder Stift 32 vom Fernbedienstecker anschließen (y = 5 V/div; x = 5 ms/div.).
- Maschine einschalten. Start drücken.
- Mit R 679 phase lock sym. minimale Pulspause einstellen (siehe Signal Pulsphase in Schaltbild).
- Maschine abschalten. Kurzschluß J 601 aufheben und Regelplatine einsetzen.

Für den Stillstand erfolgt kein Abgleich.

## F/U-Konverter "Referenz"

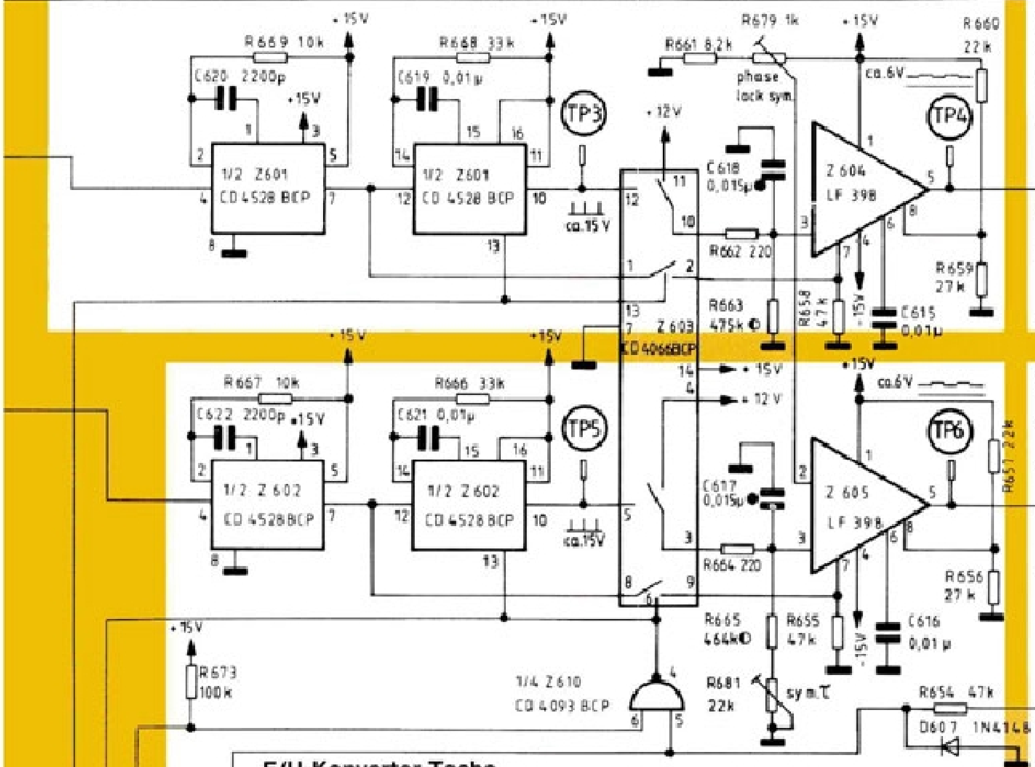
Die Nadelimpulse des "Referenzsignals" stoßen nacheinander 2 Monoflops an, die Impulse konstanter Dauer abgeben: 7/Z 601, 10/Z 601.

- 7/Z 601 HIGH. Über Analogschalter 1-2/Z 603 ist 7/Z604 ebenfalls HIGH (Sample Phase der Spannung am RC-Glied R 663/C 618).
  LOW. Über Analogschalter 1-2/Z 603 ist 7/Z 604 ebenfalls LOW (Hold Phase der Spannung am RC-Glied R 663/C 618).

Der Analogschalter 1-2/Z 603 wird von Anschluß 13/Z 603 gesteuert. Er öffnet bei Stop und schließt bei Start.

- 10/Z 601 HIGH Der Analogschalter 10-11/Z 603 wird durchgeschaltet. Am RC-Glied R 663, C 618 liegen ca. 12 V.
  LOW Schalter 10-11/Z 603 wird geöffnet, das RC-Glied R 663, C 618 entlädt sich.
- Z 603/Z 604/Z 605 arbeiten als Sample- und Hold-Stufe, die Spannung am RC-Glied wird während der Sample Phase an C 615 übernommen und während der Hold Phase am Ausgang 5/Z 604 übergeben und konstant gehalten.

Am Ausgang 5/Z 604 ist eine von der Frequenz des Referenzssignals abhängige Spannung.


+15V
R669 10k
C620 2200p
+15V
1/2 Z601
CD4528 BCP
R668 33k
C619 0,01µ
1/2 Z601
CD 4528 BCP
TP3
ca.15 V
+12V
R661 8,2k
R679 1k
phase lock sym.
+15V
R660 22k
ca.6V
C618 0,015µ
Z 604
LF 398
TP4
R662 220
R663 475k
R658 47k
-15V
C615 0,01µ
R659 27k
Z 603
CD 4066BCP
+15V
R667 10k
C622 2200p
+15V
1/2 Z 602
CD 4528BCP
R666 33k
C621 0,01µ
1/2 Z 602
CD 4528 BCP
TP5
ca.15V
+15V
+12 V
+15V
ca.6V
TP6
C617 0,015µ
Z 605
LF 398
R657 22k
R664 220
R656 27k
R665 464k
R655 47k
-15V
C616 0,01µ
+15V
R673 100k
1/4 Z 610
CD 4093 BCP
R681 22k
sym.τ
R654 47k
D607 1N4148
R672 100k
INT 12
PAN 11 13
4
OSZ 4
7
OSZ 7
INT 7
PAN 8
5
OSZ 6
INT 6

## R 679 (phase lock sym.)

- Maschine abschalten.
- Regelplatine auf Verlängerungsprint setzen.
- Maschine einschalten. Stop drücken.
- An Pin 10 der Platine mit R 679 0 V einstellen.

siehe auch Seite 27

## R 681 (sym.τ)

- Maschine abschalten.
- Regelplatine auf Verlängerungsprint setzen. Jumper 601 kurzschließen.
- Oszilloskop an Anschluß 5 der Platine (Signal Pulsphase), oder Anschluß 32 des Fernbediensteckers (y = 5 V/div; x = 5 ms/div).
- Maschine einschalten. Start drücken.
- Mit R 681 (sym.τ) minimale Pulspause einstellen (siehe Signal Pulsphase im Schaltbild S 27).
- Maschine abschalten, Kurzschluß J 601 aufheben und Regelplatine einsetzen.

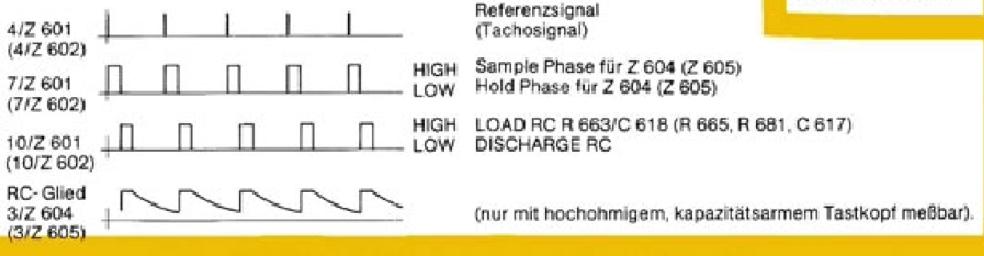
siehe auch Seite 27

## F/U-Konverter-Tacho

Die F/U-Wandlung des Tacho-Signals wird wie beim F/U-Konverter "Referenz" durchgeführt. Unterschiede:

- Der Analogschalter 8-9/Z 603 öffnet bei Stop verzögert, und zwar bei der Drehzahl ca. 0. Dadurch wird der Motor solange entgegen der Drehrichtung beschleunigt, bis er steht.
- R 681 (sym.τ). Mit R 681 werden identische Zeitkonstanten der beiden F/U-Wandler eingestellt.

**Tacho F/U-Wandlung Referenzsignal (Tachosignal)**


4/Z 601
(4/Z 602)
Referenzsignal
(Tachosignal)
7/Z 601
(7/Z 602)
HIGH
LOW
Sample Phase für Z 604 (Z 605)
Hold Phase für Z 604 (Z 605)
10/Z 601
(10/Z 602)
HIGH
LOW
LOAD RC R 663/C 618 (R 665, R 681, C 617)
DISCHARGE RC
RC-Glied
3/Z 604
(3/Z 605)

(nur mit hochohmigem, kapazitätsarmem Tastkopf meßbar).

**Summe**

Die Differ
Ausgang 7
dem Rege
sperrt bei

**Stillstan**

Bei Start I
ca. − 15 V
nung erha
stimmter
schritten
ca. + 15 V
Wandler f

**(phase ym.)**

hine abschal-

lplatine auf
ngerungs-
setzen.

hine einschal-
Stop drücken.
n 10 der Pla-
nit R 679 0 V
ellen.
uch Seite 27

**(sym.τ)**

hine abschal-

lplatine auf
ngerungs-
setzen. Jum-
01 kurzschlie-

oskop an An-
8 5 der Pla-
Signal Puls-
e), oder An-
8 32 des Fern-
nsteckers
5 V/div;
5 ms/div).
hine einschal-
Start drücken.
681 (sym.τ)
nale Pulspau-
nstellen (siehe
l Pulsphase
haltbild S 27).
hine abschal-
Kurzschluß
aufheben
Regelplatine
tzen.
uch Seite 27

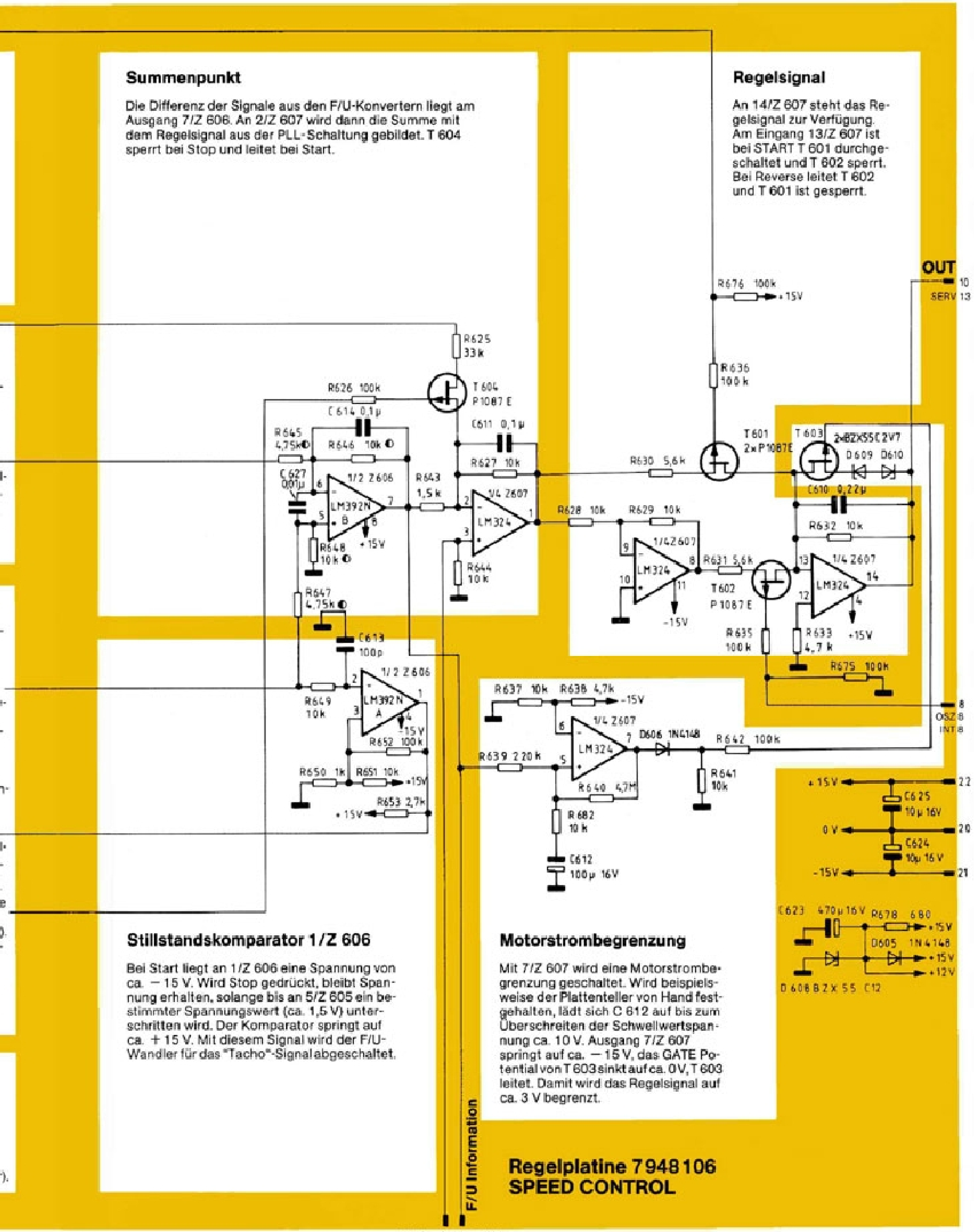
kopf meßbar).

### Summenpunkt

Die Differenz der Signale aus den F/U-Konvertern liegt am Ausgang 7/Z 606. An 2/Z 607 wird dann die Summe mit dem Regelsignal aus der PLL-Schaltung gebildet. T 604 sperrt bei Stop und leitet bei Start.

### Regelsignal

An 14/Z 607 steht das Regelsignal zur Verfügung. Am Eingang 13/Z 607 ist bei START T 601 durchgeschaltet und T 602 sperrt. Bei Reverse leitet T 602 und T 601 ist gesperrt.



OUT
10
SERV 13
R676 100k
+15V
R625
33k
R636
100k
R626 100k
T604
P1087E
C614 0,1µ
C611 0,1µ
R645
4,75k
R646 10k
C627
0,01µ
1/2 Z606
LM392N
B
R643
1,5k
R627 10k
1/4 Z607
LM324
R630 5,6k
T601
2xP1087E
T603
2xBZX55C2V7
D609
D610
C610 0,22µ
R632 10k
R648
10k
+15V
R644
10k
R628 10k
R629 10k
1/4Z607
LM324
-15V
R631 5,6k
T602
P1087E
1/4 Z607
LM324
+15V
R635
100k
R633
4,7k
R675 100k
R647
4,75k
C613
100p
1/2 Z606
LM392N
A
R649
10k
R652 100k
R650 1k
R651 10k
+15V
R653 2,7k
R637 10k
R638 4,7k
-15V
1/4 Z607
LM324
D606 1N4148
R642 100k
8
OSZ 8
INT 8
R639 220k
R640 4,7M
R641
10k
R682
10k
C612
100µ 16V
+15V
22
C625
10µ 16V
0V
20
C624
10µ 16V
-15V
21
C623 470µ 16V
R678 680
D605 1N4148
+15V
+12V
D608 BZX55 C12
F/U Information
OSZ 11
11
1
REM 31

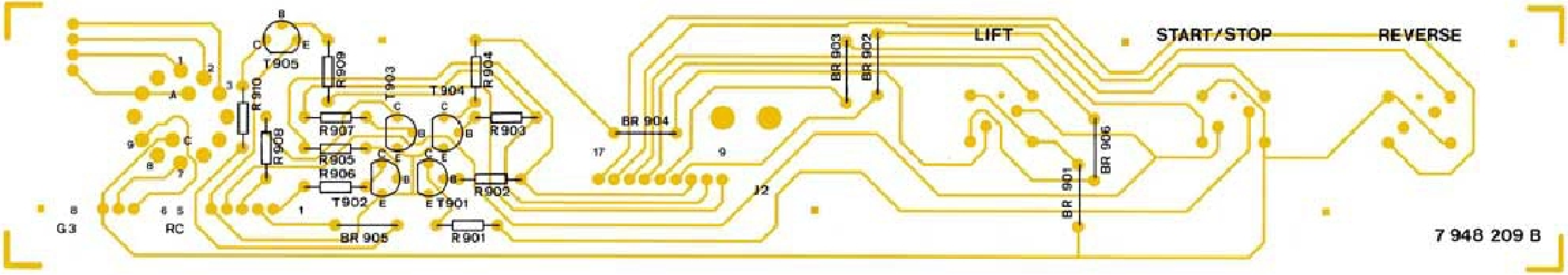
### Stillstandskomparator 1/Z 606

Bei Start liegt an 1/Z 606 eine Spannung von ca. − 15 V. Wird Stop gedrückt, bleibt Spannung erhalten, solange bis an 5/Z 605 ein bestimmter Spannungswert (ca. 1,5 V) unterschritten wird. Der Komparator springt auf ca. + 15 V. Mit diesem Signal wird der F/U-Wandler für das "Tacho"-Signal abgeschaltet.

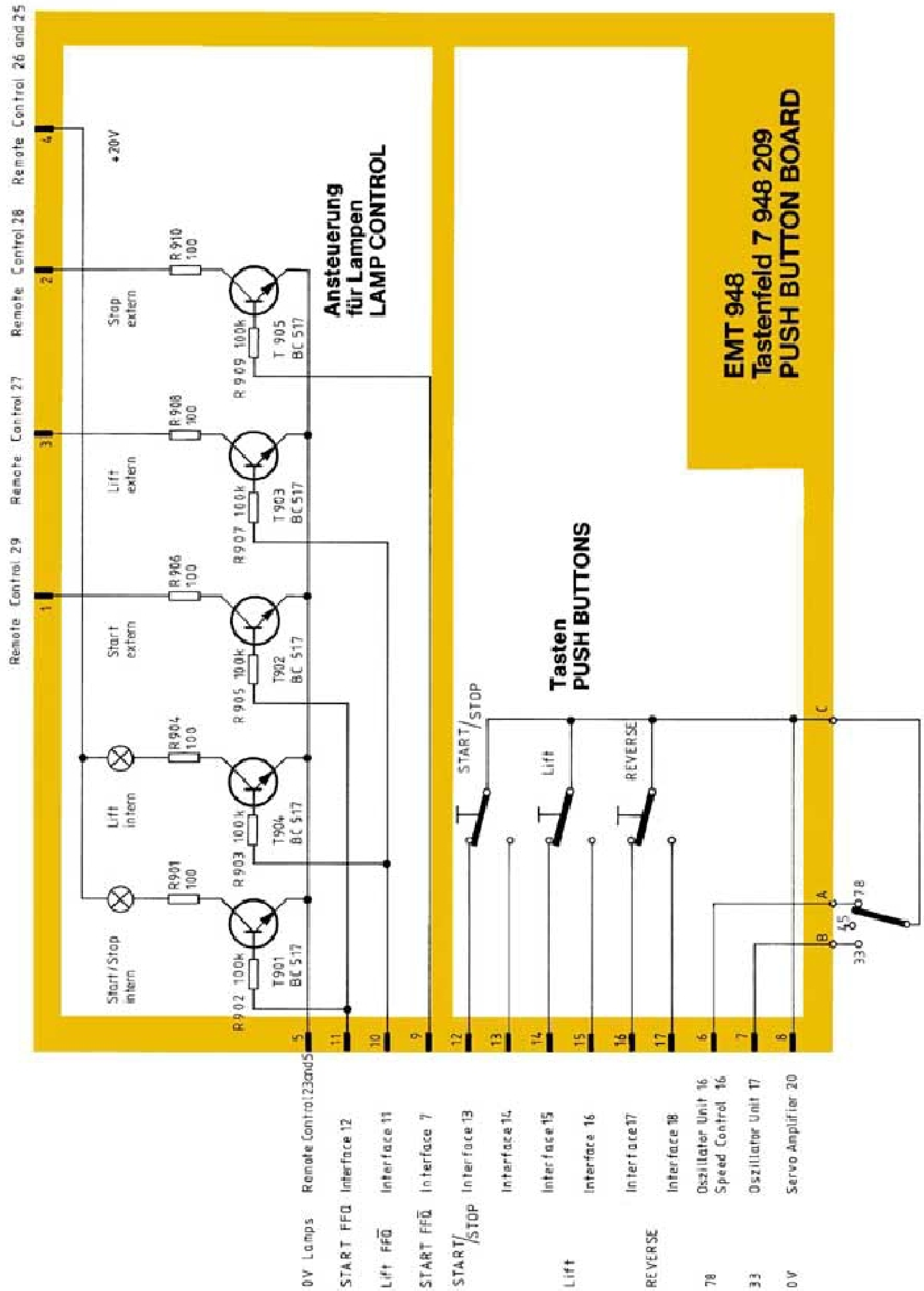
### Motorstrombegrenzung

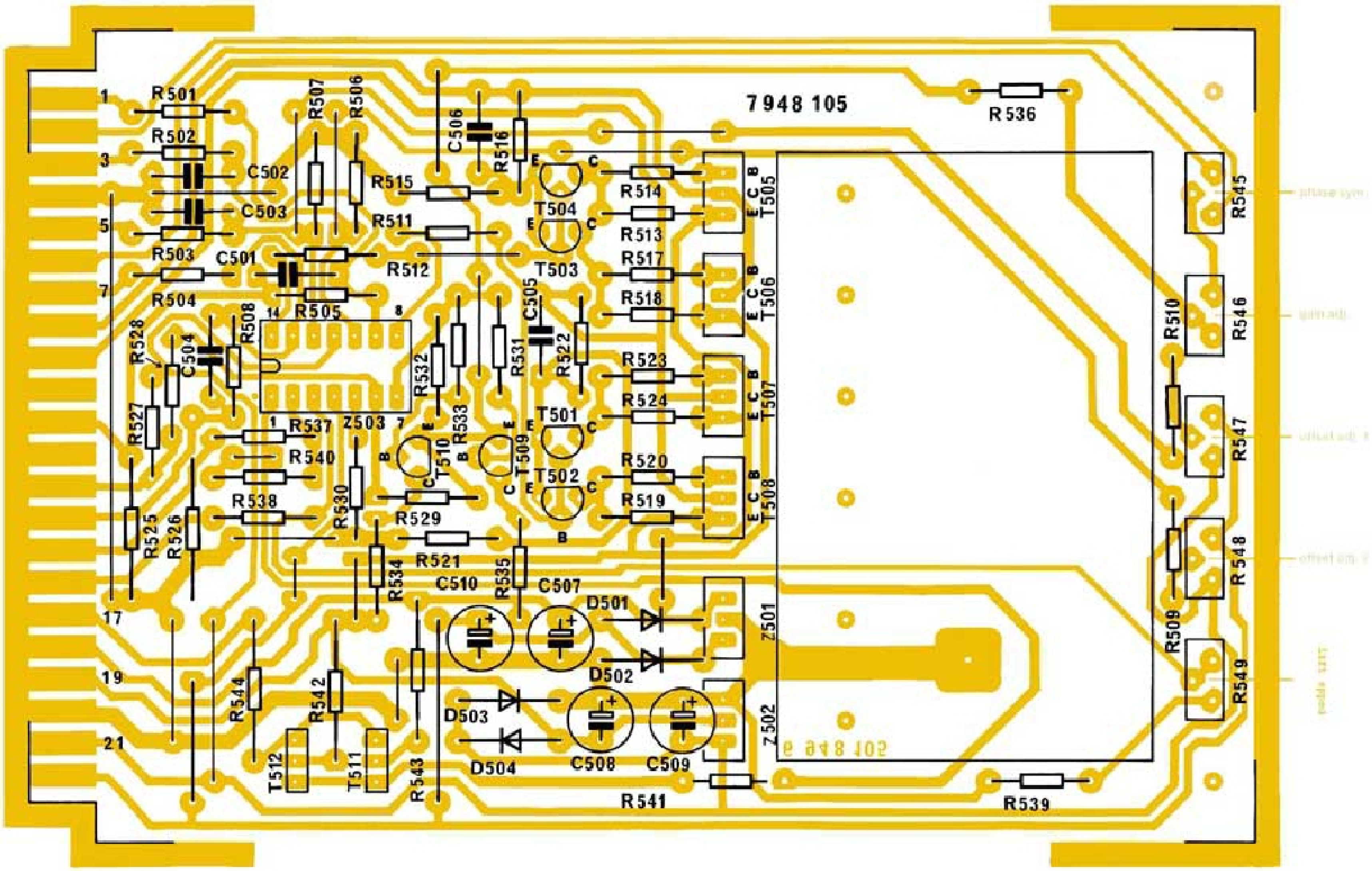
Mit 7/Z 607 wird eine Motorstrombegrenzung geschaltet. Wird beispielsweise der Plattenteller von Hand festgehalten, lädt sich C 612 auf bis zum Überschreiten der Schwellwertspannung ca. 10 V. Ausgang 7/Z 607 springt auf ca. − 15 V, das GATE Potential von T 603 sinkt auf ca. 0V, T 603 leitet. Damit wird das Regelsignal auf ca. 3 V begrenzt.

## Regelplatine 7948106
## SPEED CONTROL


LIFT
START/STOP
REVERSE
T905
R909
T903
T904
R904
R910
R908
R907
R905
R906
R903
T902
T901
R902
BR 905
R901
BR 904
BR 903
BR 902
BR 906
BR 901
J2
17
9
1
2
3
A
C
B
E
G3
RC
7 948 209 B

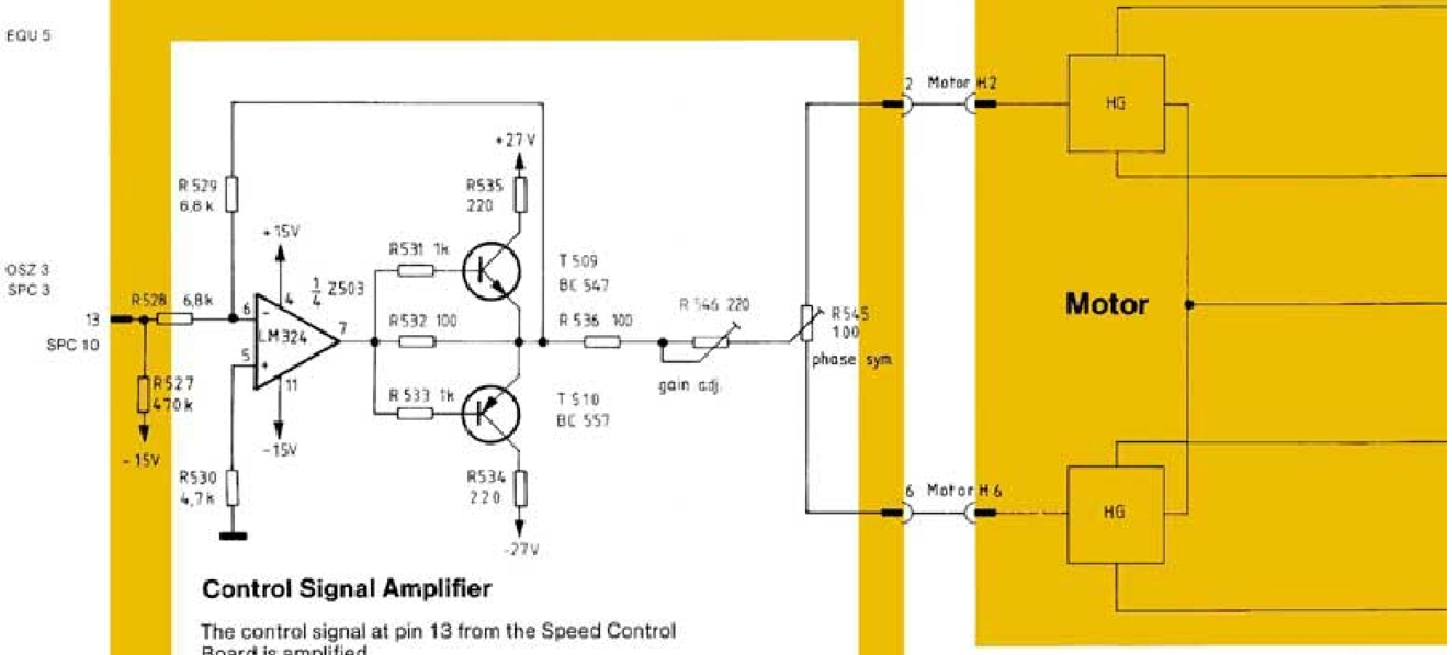
**EMT 948**
**Tastenfeld 7 948 209**
**PUSH BUTTON BOARD**


EMT 948
Tastenfeld 7 948 209
PUSH BUTTON BOARD
Ansteuerung
für Lampen
LAMP CONTROL
Tasten
PUSH BUTTONS
Remote Control 29
Remote Control 27
Remote Control 28
Remote Control 26 and 25
1
3
2
4
+20V
Start/Stop intern
Lift intern
Start extern
Lift extern
Stop extern
R901 100
R904 100
R906 100
R908 100
R910 100
R902 100k
R903 100k
R905 100k
R907 100k
R909 100k
T901 BC517
T904 BC517
T902 BC517
T903 BC517
T905 BC517
START/STOP
Lift
REVERSE
C
A
B
78
45
33
5
11
10
9
12
13
14
15
16
17
6
7
8
0V Lamps
Remote Control 23 and 5
START FFQ
Interface 12
Lift FFQ̄
Interface 11
START FFQ̄
Interface 7
START/STOP
Interface 13
Interface 14
Lift
Interface 15
Interface 16
REVERSE
Interface 17
Interface 18
78
Oszillator Unit 16
Speed Control 16
33
Oszillator Unit 17
0V
Servo Amplifier 20


7948 105
1
3
5
7
17
19
21
R501
R502
R503
R504
R505
R506
R507
R508
R509
R510
R511
R512
R513
R514
R515
R516
R517
R518
R519
R520
R521
R522
R523
R524
R525
R526
R527
R528
R529
R530
R531
R532
R533
R534
R535
R536
R537
R538
R539
R540
R541
R542
R543
R544
R545
R546
R547
R548
R549
C501
C502
C503
C504
C505
C506
C507
C508
C509
C510
D501
D502
D503
D504
T501
T502
T503
T504
T505
T506
T507
T508
T509
T510
T511
T512
Z501
Z502
Z503
E C B
phase sym.
gain adj.
offset adj. 1
offset adj. 2
lift speed

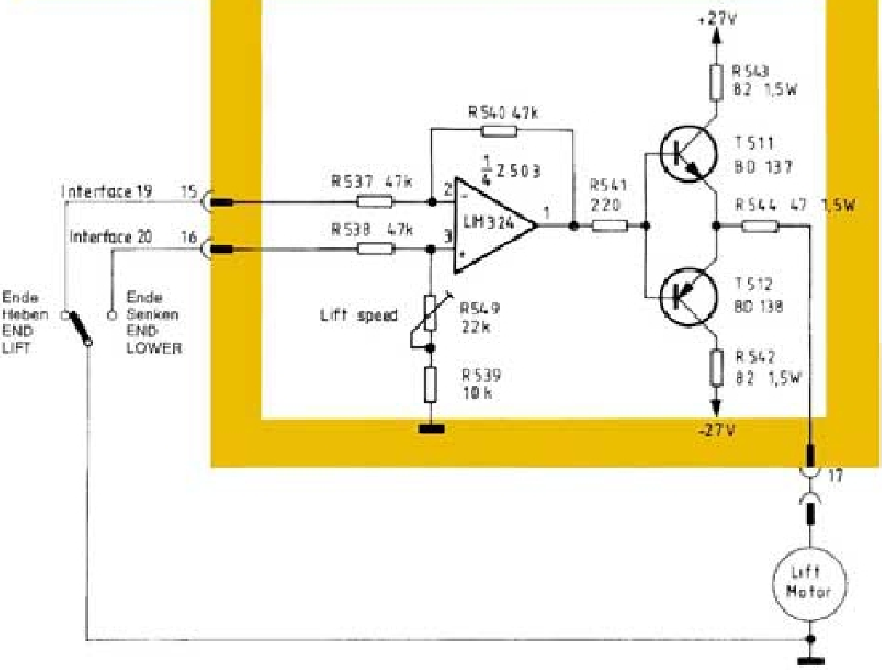
**EMT 948**
**Endstufen-Platine**
**SERVO AMPLIFIER**

## Endstufen-Platine 7 948 105
## SERVO AMPLIFIER


EGU 5
OSZ 3
SPC 3
13
SPC 10
R528 6,8k
R527 470k
-15V
R529 6,8k
+15V
1/4 Z503
LM324
4
5
6
7
11
-15V
R530 4,7k
R531 1k
R532 100
R533 1k
+27V
R535 220
T509 BC 547
T510 BC 557
R534 220
-27V
R536 100
R546 220
gain adj.
R545 100
phase sym
2 Motor H2
6 Motor H6
HG
HG
Motor

### Control Signal Amplifier

The control signal at pin 13 from the Speed Control Board is amplified.


+27V
R543 82 1,5W
R540 47k
1/4 Z503
LM324
2
3
1
T511 BD 137
R541 220
R544 47 1,5W
T512 BD 138
R542 82 1,5W
-27V
Interface 19 15
Interface 20 16
R537 47k
R538 47k
Lift speed
R549 22k
R539 10k
17
Lift Motor
Ende Heben END LIFT
Ende Senken END LOWER

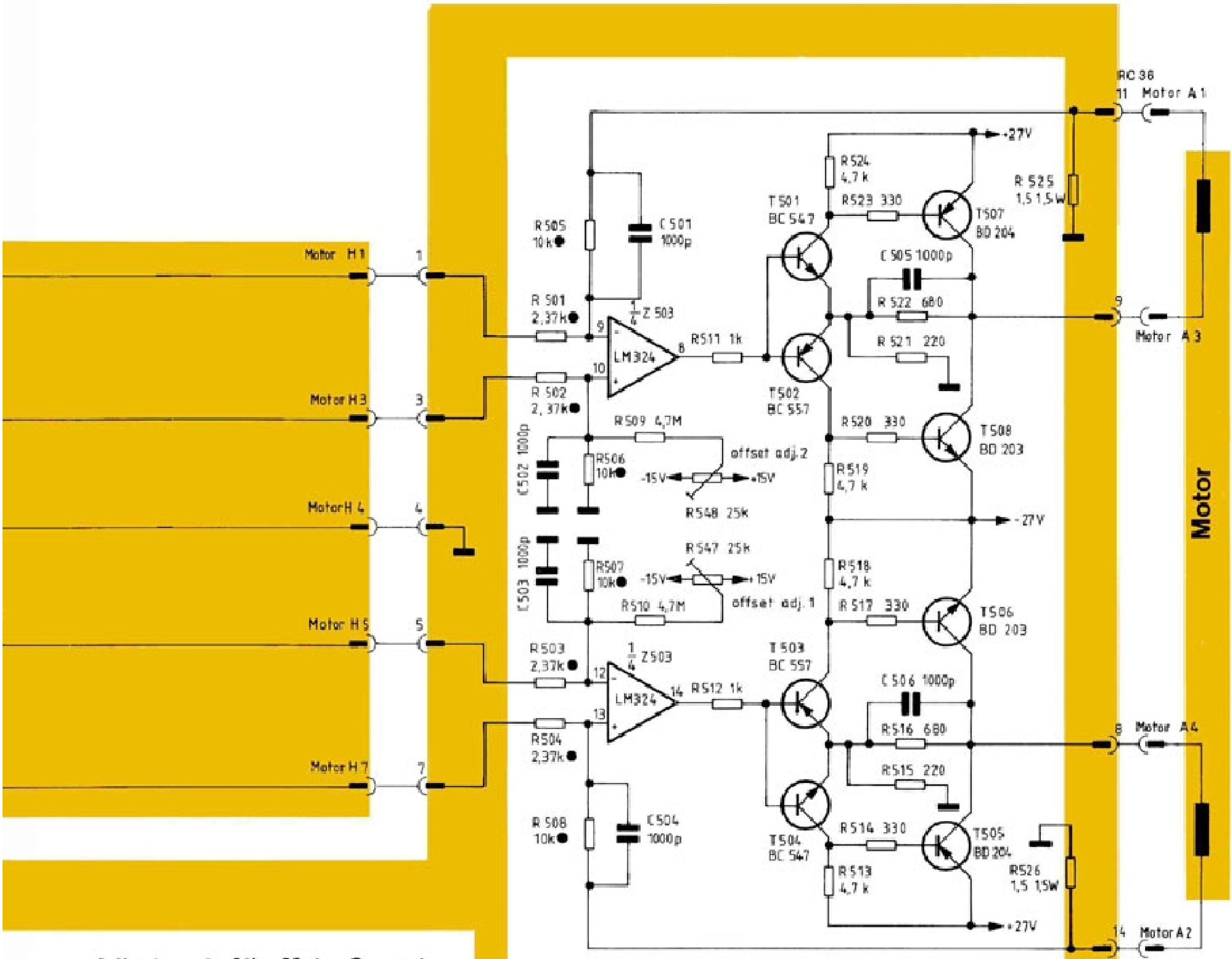
### R 549 Lift Speed

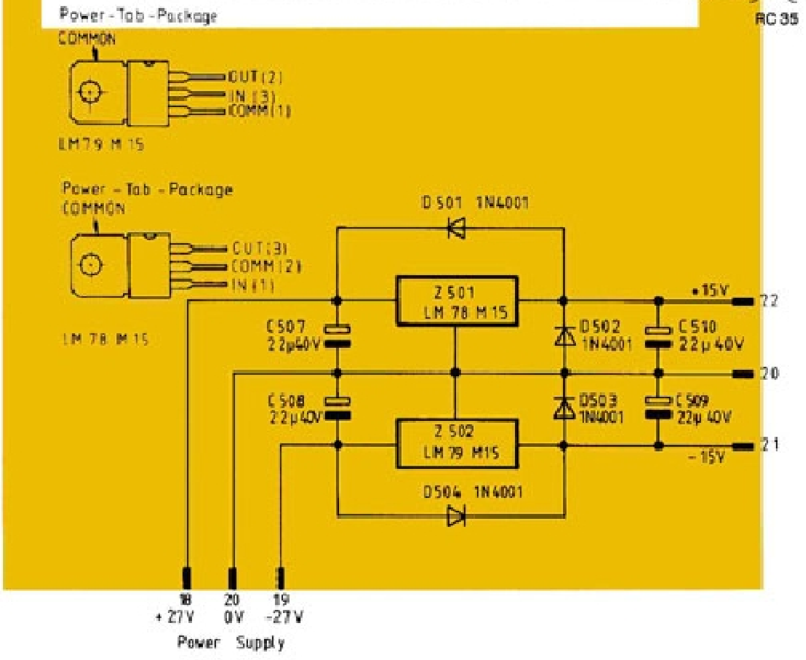
The raising and lowering of the lift is adjusted with R 549. The setting is uncritical.

### Adj

**R 54**
**R 54**
**R 54**
**R 54**

- Tu
- Pu
  Se
  bo
- Tu
  wi
- C
  di
  11
  to
  co
- S
  th
  ac
- S
  tu
- S
  ga
- T

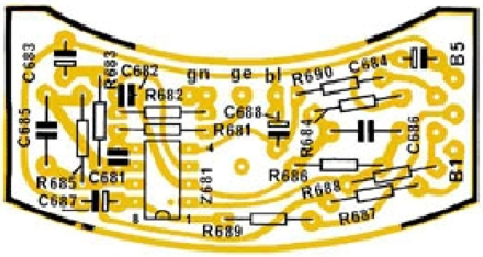

RC 36
11 Motor A 1
+27V
R 524 4,7 k
R 523 330
T 501 BC 547
T 507 BD 204
R 525 1,5 1,5W
R 505 10k●
C 501 1000p
C 505 1000p
Motor H 1
1
R 501 2,37k●
1/4 Z 503
9
LM324
8
R 511 1k
10
R 522 680
9
R 521 220
Motor A 3
Motor H 3
3
R 502 2,37k●
T 502 BC 557
R 509 4,7M
R 520 330
T 508 BD 203
C502 1000p
R506 10k●
offset adj. 2
-15V
+15V
R 519 4,7 k
R 548 25k
Motor H 4
4
-27V
Motor
R 547 25k
R 518 4,7 k
C503 1000p
R507 10k●
-15V
+15V
R 510 4,7M
offset adj. 1
R 517 330
T 506 BD 203
Motor H 5
5
R 503 2,37k●
1/4 Z 503
T 503 BC 557
12
LM324
14
R 512 1k
C 506 1000p
13
R 516 680
8
Motor A 4
R504 2,37k●
Motor H 7
7
R 515 220
R 508 10k●
C 504 1000p
T 504 BC 547
R 514 330
T 505 BD 204
R 513 4,7 k
R526 1,5 1,5W
+27V
14 Motor A 2


RC 35
Power - Tab - Package
COMMON
OUT (2)
IN (3)
COMM (1)
LM 79 M 15
Power - Tab - Package
COMMON
OUT (3)
COMM (2)
IN (1)
LM 78 M 15
D 501 1N4001
Z 501 LM 78 M 15
+15V
22
C 507 22µ40V
D502 1N4001
C 510 22µ 40V
20
C 508 22µ40V
D503 1N4001
C 509 22µ 40V
Z 502 LM 79 M15
21
-15V
D504 1N4001
18 +27V
20 0V
19 -27V
Power Supply

## Adjustment of the Motor Currents

**R 545 phase sym.**  
**R 546 gain adj.**  
**R 548 offs. adj. 2**  
**R 547 offs. adj. 1**

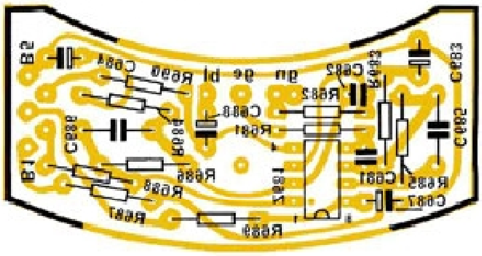
- Turn off the unit.
- Pull out all circuit boards. Reinsert the Servo Amplifier Board on the extension board.
- Turn on the unit. The turntable platter will turn slightly forwards.
- Connect an oscilloscope (y = 50 mV/div, x = minimum sweep speed) to pins 11 and 14 of the board (0 V: pin 20) or to pins 35 and 36 of the Remote Control connector (0 V: pin 34).
- Set both signals symmetrically about their zero-signal levels with R 547 offset adj. 1 and R 548 offset adj. 2.
- Set both signals to an identical amplitude with R 545 phase sym.
- Set the signals to 100 $mV_{pp}$ with R 546 gain adj.
- Turn off the unit. Reinsert all boards.

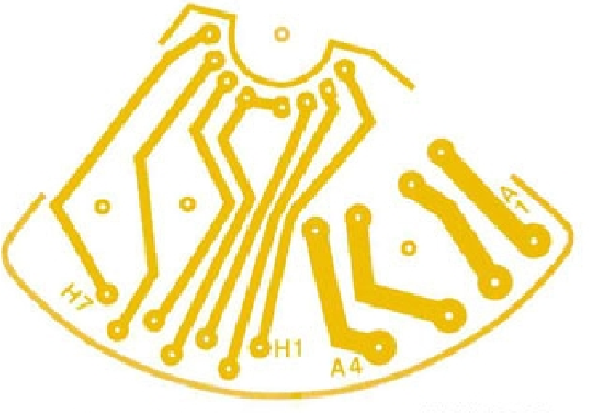

C683
R683
C682
gn
ge
bl
R690
C684
B5
R682
C688
R681
C685
C686
R684
R685
C681
R686
Z681
B1
C687
R688
R687
R689

Sicht auf Bauelementeseite
COMPONENT SIDE VIEW

# EMT 948
# Tachoverstärker
# TACHO AMPLIFIER

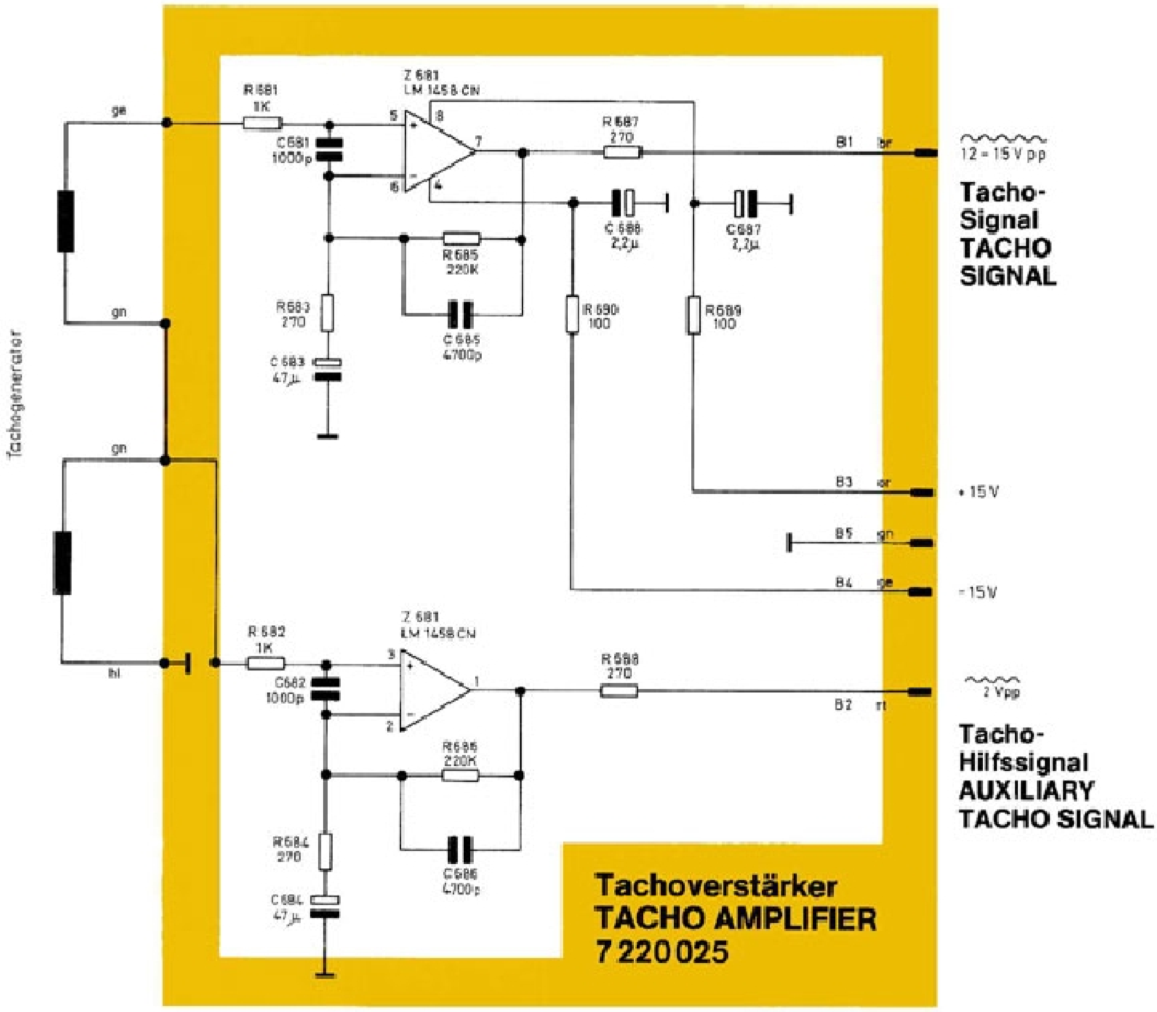
Sicht auf Leiterbahnseite
CONNECTOR SIDE VIEW





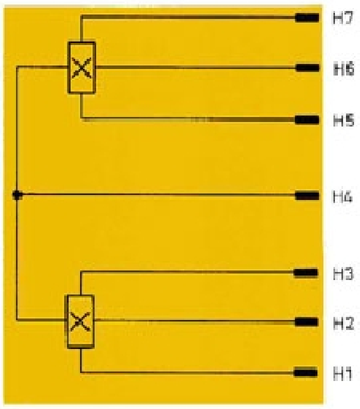
Sicht auf Leiterbahnseite
CONNECTOR SIDE VIEW

# EMT 948
# MOTOR

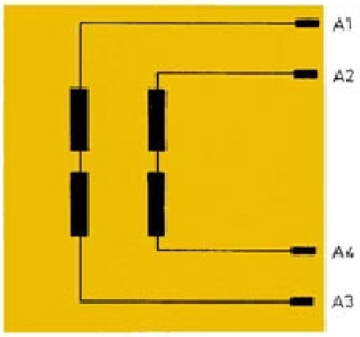

Tachogenerator
ge
gn
gn
hl
R 681
1K
C 681
1000p
Z 681
LM 1458 CN
5
8
7
6
4
R 687
270
C 688
2,2µ
C 687
2,2µ
R 685
220K
C 685
4700p
R 683
270
C 683
47µ
R 690
100
R 689
100
B1
br
12 = 15 V pp
Tacho-
Signal
TACHO
SIGNAL
B3
or
+ 15 V
B5
gn
B4
ge
- 15 V
R 682
1K
C 682
1000p
Z 681
LM 1458 CN
3
2
1
R 688
270
B2
rt
2 Vpp
R 686
220K
C 686
4700p
R 684
270
C 684
47µ
Tacho-
Hilfssignal
AUXILIARY
TACHO SIGNAL

**Tachoverstärker**
**TACHO AMPLIFIER**
**7 220 025**

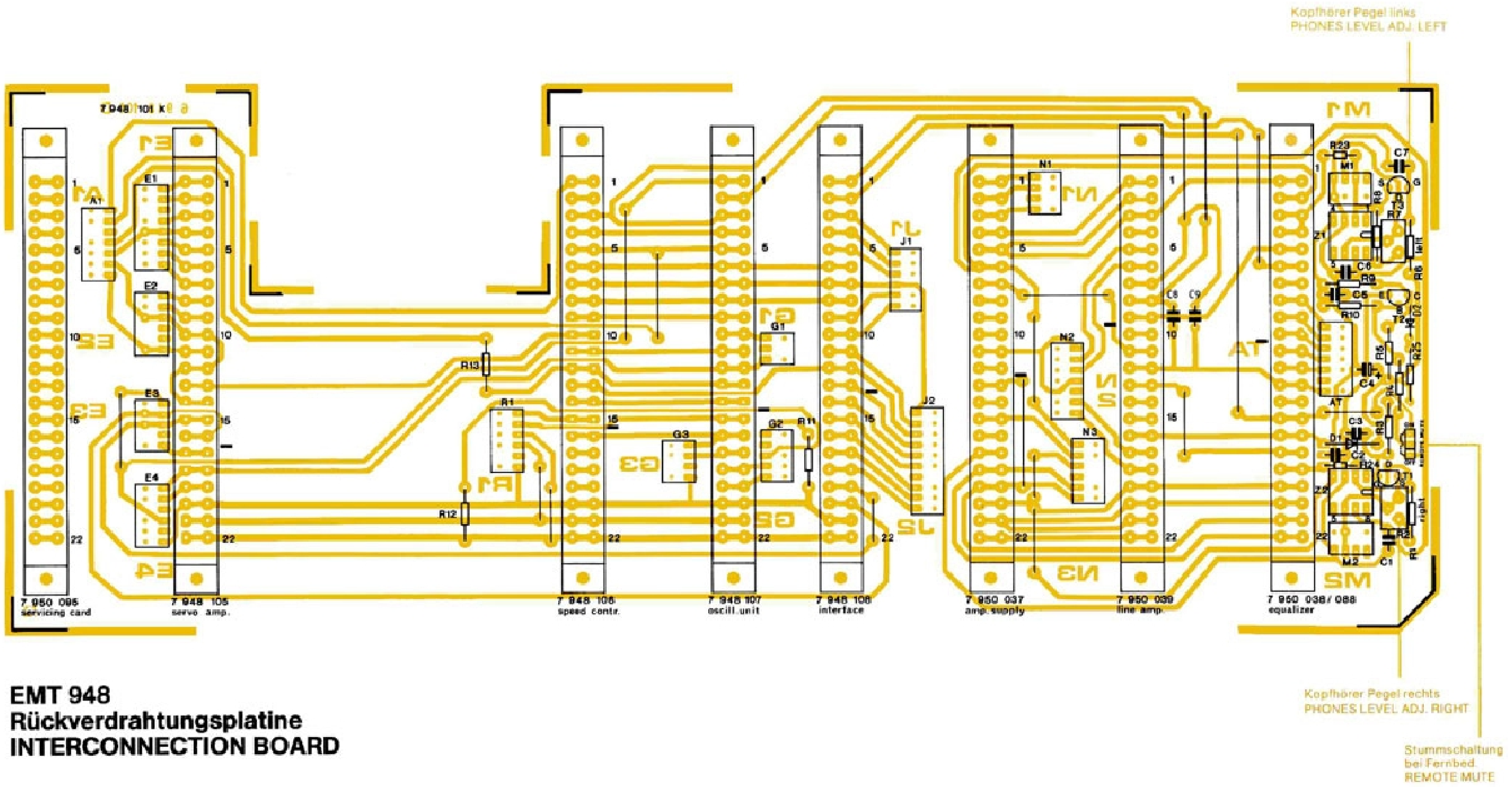
## MOTOR 9 220 000


H7
H6
H5
H4
H3
H2
H1

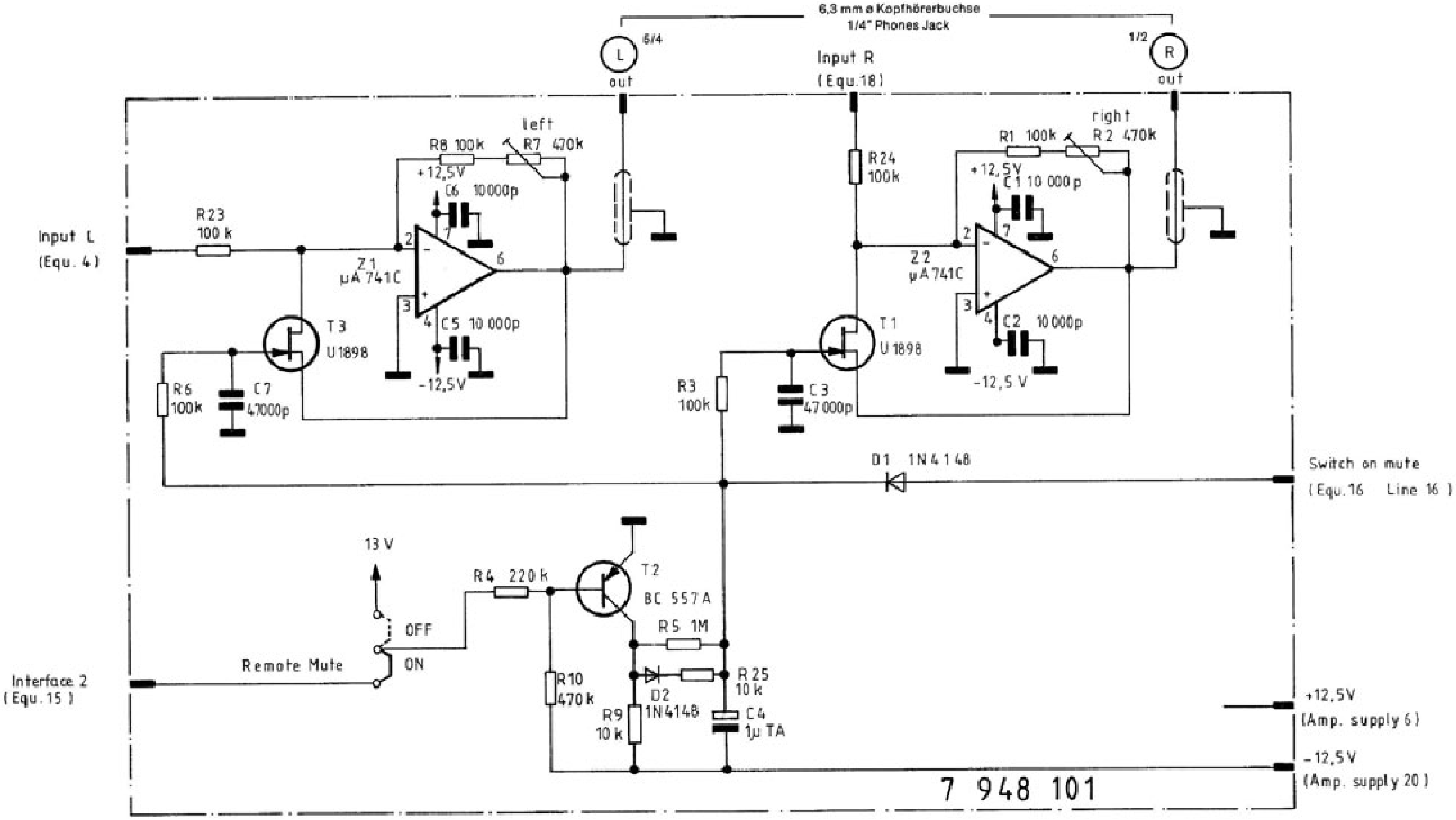
**Anschlüsse**
**Hallgeneratoren**
**HALL ELEMENTS**
**CONNECTIONS**



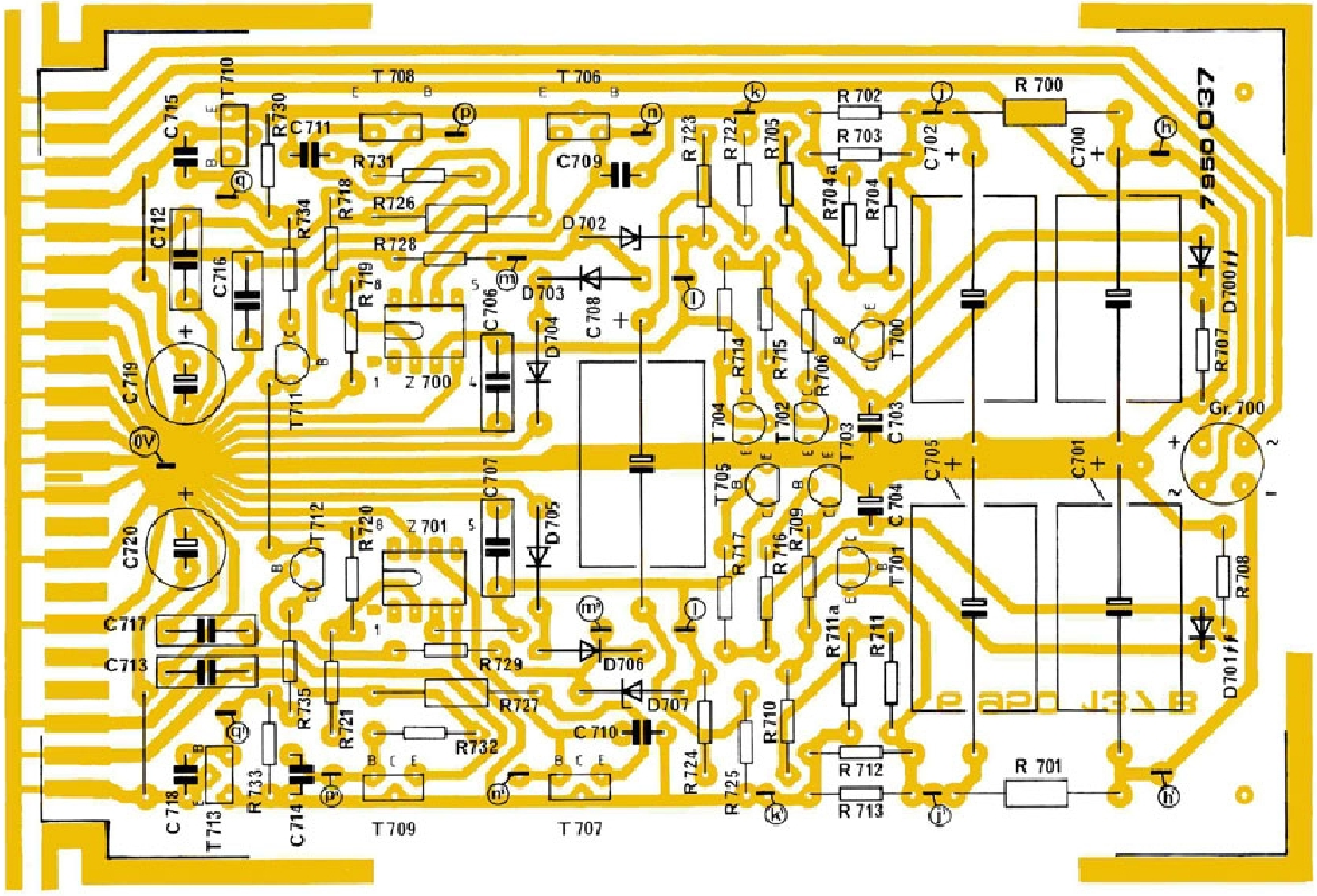
**Anschlüsse**
**Motorwicklungen**
**MOTOR COILS**
**CONNECTIONS**


Kopfhörer Pegel links
PHONES LEVEL ADJ. LEFT
Kopfhörer Pegel rechts
PHONES LEVEL ADJ. RIGHT
Stummschaltung
bei Fernbed.
REMOTE MUTE
7 948 101 K
7 950 095
servicing card
7 948 105
servo amp.
7 948 106
speed contr.
7 948 107
oscill.unit
7 948 108
interface
7 950 037
amp.supply
7 950 039
line amp.
7 950 038/088
equalizer
A1
E1
E2
E3
E4
R1
R12
R13
G1
G2
G3
R11
J1
J2
N1
N2
N3
C8
C9
AT
M1
M2
R23
C7
R8
R7
Z1
C6
R9
C5
R10
T2
R25
R5
C4
R4
R3
C3
D1
C2
R24
T1
Z2
R2
C1
R1
left
right
1
5
10
15
22

# EMT 948
# Rückverdrahtungsplatine
# INTERCONNECTION BOARD

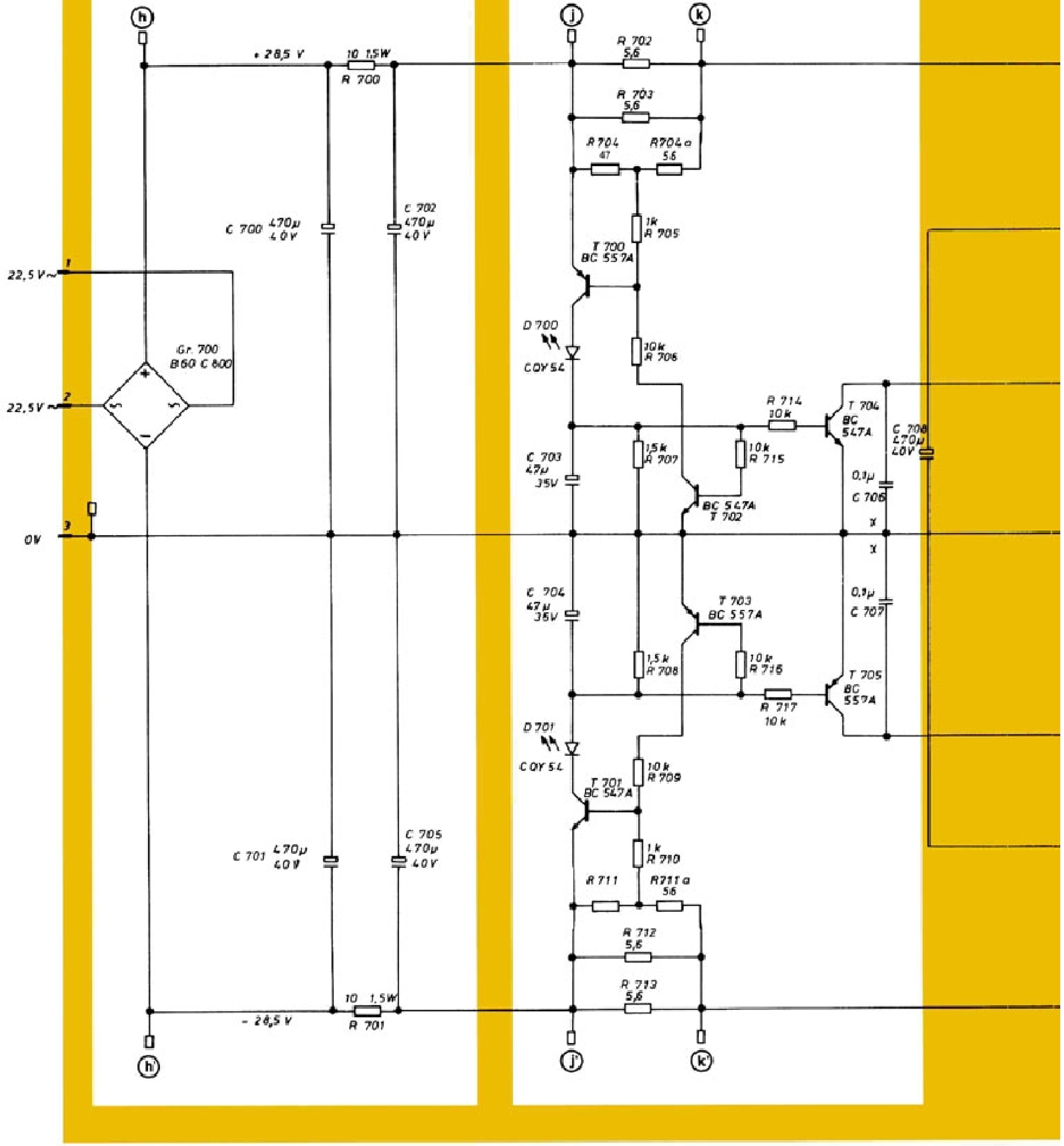

6,3 mm ø Kopfhörerbuchse
1/4" Phones Jack
L
6/4
out
Input R
(Equ.18)
1/2
R
out
left
R8 100k
R7 470k
+12,5V
C6 10000p
Input L
(Equ. 4)
R23
100 k
Z1
µA 741C
T3
U1898
C5 10 000p
-12,5V
R6
100k
C7
47000p
R24
100k
right
R1 100k
R2 470k
+12,5V
C1 10 000p
Z2
µA 741C
T1
U1898
C2 10 000p
-12,5 V
R3
100k
C3
47000p
D1 1N4148
Switch on mute
(Equ.16 Line 16)
13 V
OFF
ON
Remote Mute
Interface 2
(Equ. 15)
R4 220k
T2
BC 557A
R5 1M
R10
470k
R9
10 k
D2
1N4148
R25
10 k
C4
1µ TA
+12,5V
(Amp. supply 6)
-12,5V
(Amp. supply 20)
7 948 101

**Hilfsmonitorstufe auf Rückverdrahtungsplatine**
**AUXILIARY MONITOR ON CONNECTOR PRINT BOARD**


7950 037
R 700
R 701
R 702
R 703
R 704
R 704a
R 705
R 706
R 707
R 708
R 709
R 710
R 711
R 711a
R 712
R 713
R 714
R 715
R 716
R 717
R 718
R 719
R 720
R 721
R 722
R 723
R 724
R 725
R 726
R 727
R 728
R 729
R 730
R 731
R 732
R 733
R 734
R 735
C 700
C 701
C 702
C 703
C 704
C 705
C 706
C 707
C 708
C 709
C 710
C 711
C 712
C 713
C 714
C 715
C 716
C 717
C 718
C 719
C 720
D 700
D 701
D 702
D 703
D 704
D 705
D 706
D 707
T 700
T 701
T 702
T 703
T 704
T 705
T 706
T 707
T 708
T 709
T 710
T 711
T 712
T 713
Z 700
Z 701
Gr. 700
0V

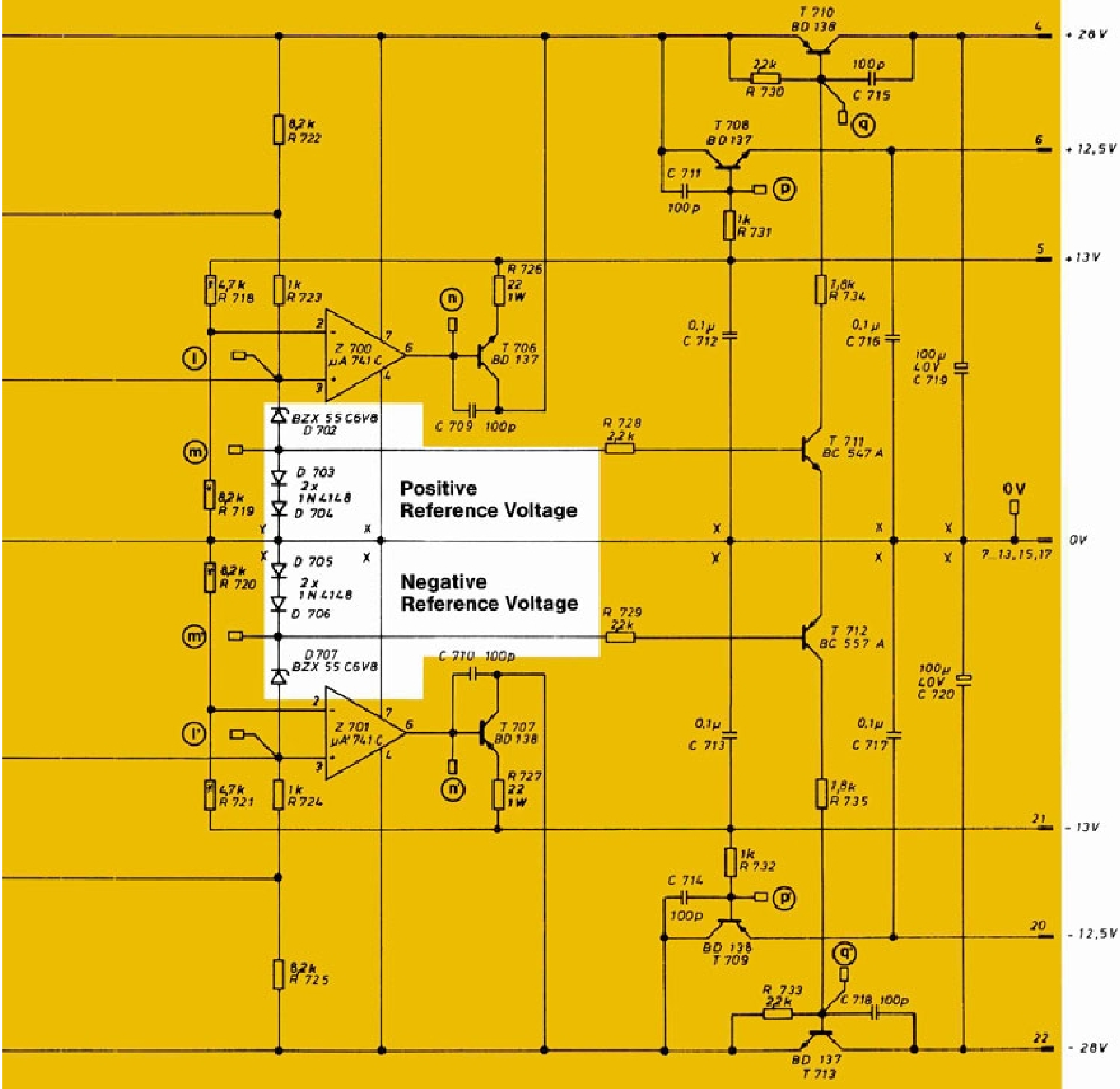
**EMT 948**
**Verstärker-Stromversorgung**
**AMPLIFIER SUPPLY**

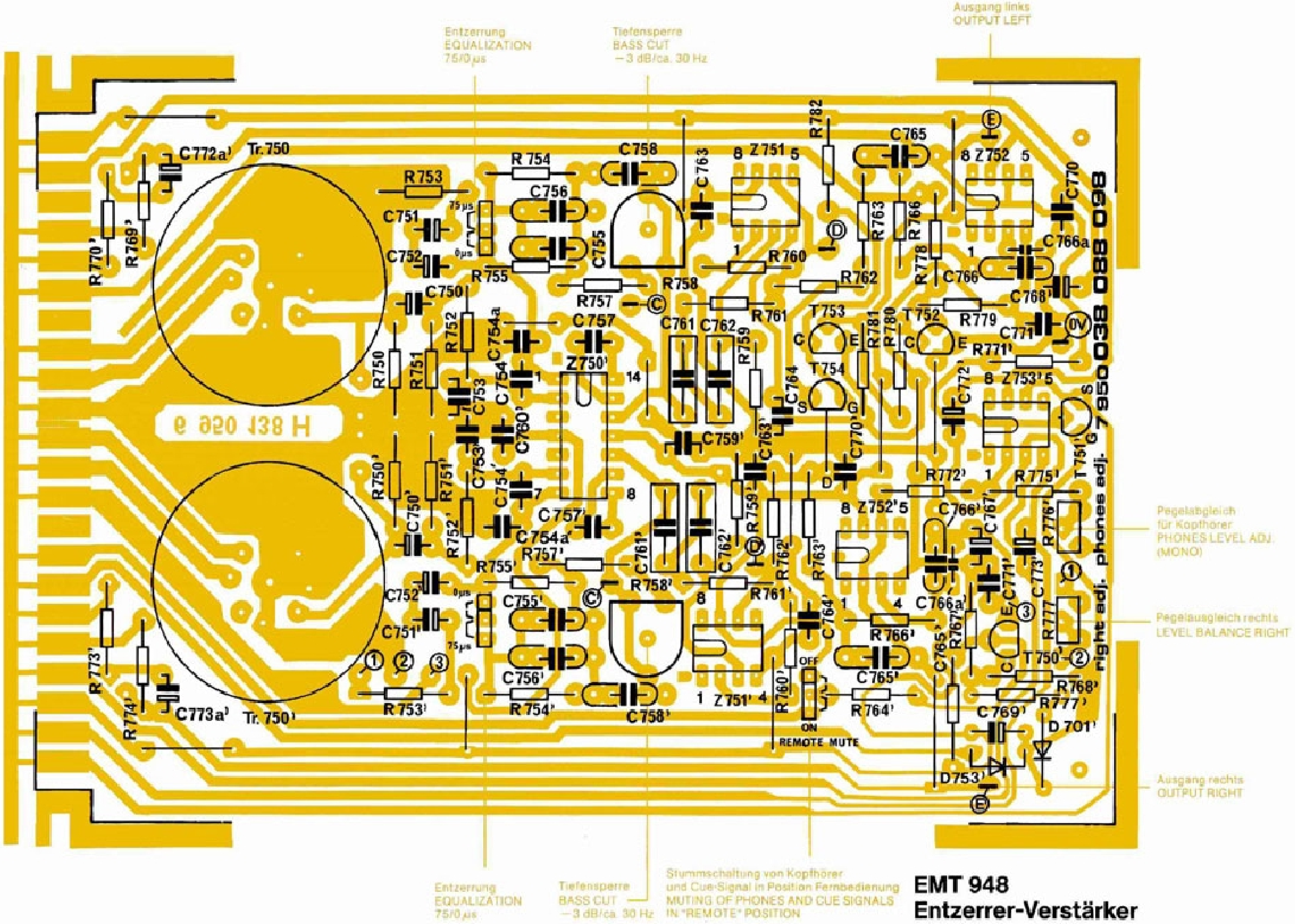
# Rectifier with Filter Circuit



h
+ 28,5 V
10 1,5W
R 700
C 700 470µ 40V
C 702 470µ 40V
22,5 V~ 1
22,5 V~ 2
Gr. 700
B60 C 800
0V 3
C 701 470µ 40V
C 705 470µ 40V
10 1,5W
R 701
- 28,5 V
h'
j
k
R 702 5,6
R 703 5,6
R 704 47
R704 a 5,6
1k R 705
T 700 BC 557A
D 700
COY 54
10 k R 706
C 703 47µ 35V
1,5 k R 707
10 k R 715
BC 547A T 702
R 714 10 k
T 704 BC 547A
C 708 470µ 40V
0,1µ C 706
x
x
0,1µ C 707
C 704 47µ 35V
T 703 BC 557A
1,5 k R 708
10 k R 716
R 717 10 k
T 705 BC 557A
D 701
COY 54
T 701 BC 547A
10 k R 709
1 k R 710
R 711
R711 a 5,6
R 712 5,6
R 713 5,6
j'
k'

# Amplifier-Supply-Platine 7 950 037
# AMPLIFIER SUPPLY BOARD


T 710
BD 138
22k
R 730
100p
C 715
q
T 708
BD 137
C 711
100p
p
1k
R 731
8,2k
R 722
4,7k
R 718
1k
R 723
R 726
22
1W
n
Z 700
µA 741 C
T 706
BD 137
l
C 709 100p
BZX 55 C6V8
D 702
m
D 703
2x
1N 4148
D 704
Positive
Reference Voltage
8,2k
R 719
8,2k
R 720
D 705
2x
1N 4148
D 706
Negative
Reference Voltage
m'
D 707
BZX 55 C6V8
C 710 100p
Z 701
µA 741 C
T 707
BD 138
l'
n'
R 727
22
1W
4,7k
R 721
1k
R 724
R 728
2,2k
T 711
BC 547 A
R 729
2,2k
T 712
BC 557 A
0,1µ
C 712
0,1µ
C 716
100µ
40V
C 719
1,8k
R 734
0,1µ
C 713
0,1µ
C 717
100µ
40V
C 720
1,8k
R 735
1k
R 732
C 714
100p
p'
BD 138
T 709
q'
R 733
22k
C 718 100p
BD 137
T 713
8,2k
R 725
0V
7, 13, 15, 17
4
+ 28V
6
+ 12,5V
5
+ 13V
0V
21
- 13V
20
- 12,5V
22
- 28V

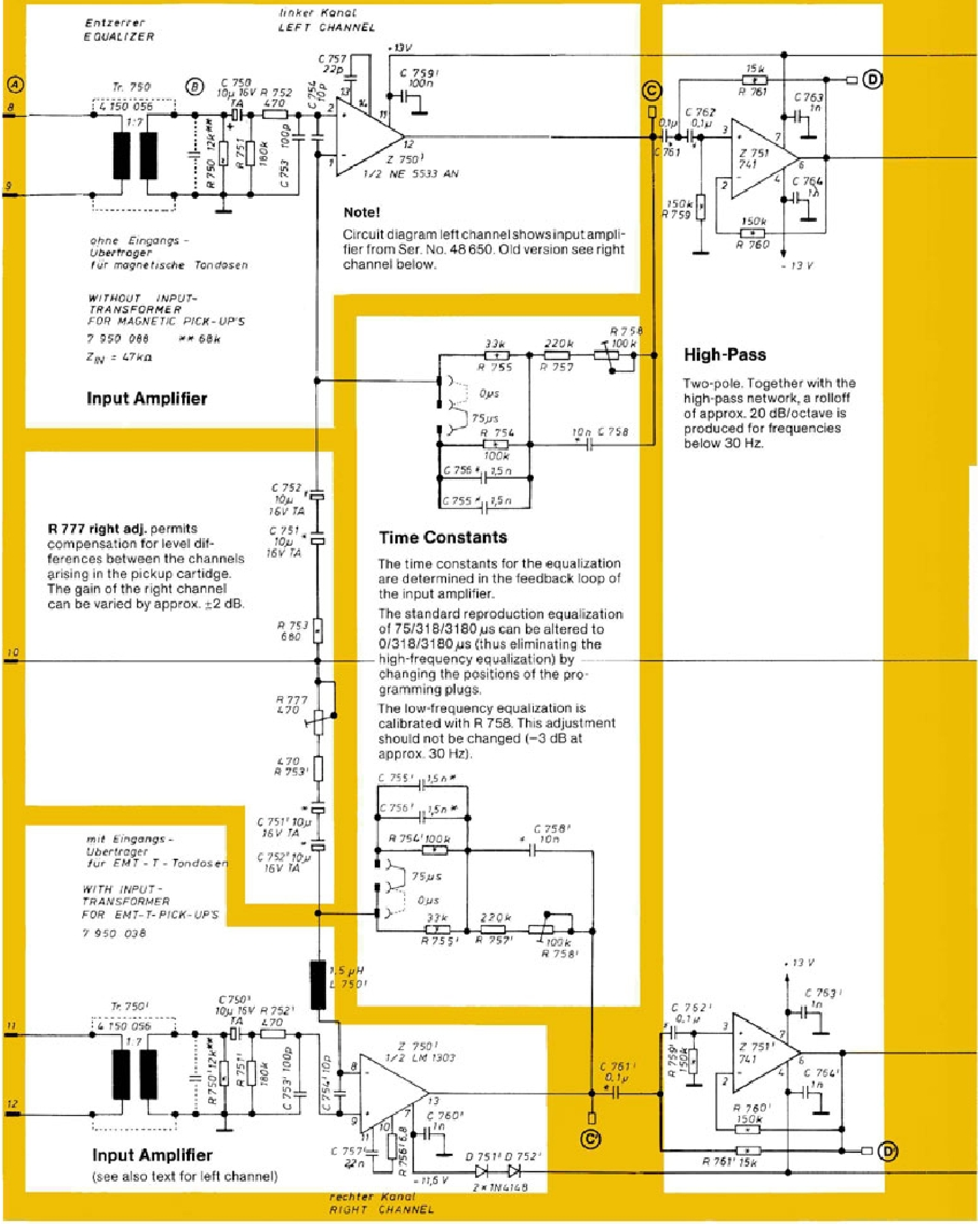

Ausgang links
OUTPUT LEFT
Entzerrung
EQUALIZATION
75/0 µs
Tiefensperre
BASS CUT
−3 dB/ca. 30 Hz
Pegelabgleich
für Kopfhörer
PHONES LEVEL ADJ.
(MONO)
Pegelausgleich rechts
LEVEL BALANCE RIGHT
Ausgang rechts
OUTPUT RIGHT
Entzerrung
EQUALIZATION
75/0 µs
Tiefensperre
BASS CUT
−3 dB/ca. 30 Hz
Stummschaltung von Kopfhörer
und Cue-Signal in Position Fernbedienung
MUTING OF PHONES AND CUE SIGNALS
IN "REMOTE" POSITION
7 950 038 088 098
right adj. phones adj.
6 950 138 H
Tr. 750
Tr. 750'
C772a'
C773a'
R770'
R769'
R773'
R774'
R753
R753'
C751
C752
C751'
C752'
75 µs
0 µs
R754
R754'
C756
C755
C756'
C755'
R755
R755'
C758
C758'
C763
Z751
Z751'
R782
C765
C765'
Z752
Z752'
C770
C766a
C766
C768'
R763
R766
R778
R760
R762
R758
R757
C750'
R752
R751
R750
C754a
C754
C753
C760'
C757
Z750'
14
8
7
1
C761
C762
R759
R761
T753
T754
T752
R781
R780
R779
C771
0V
R771'
Z753'
C772'
C759'
C763'
C764
C770'
T751'
R772'
R775'
R776'
C766'
C767'
C771'
C773'
R777
T750'
R768'
R777'
C769'
D701'
D753'
R764'
R760'
R766'
R767'
C764'
R763'
R762'
R761'
R759'
R758'
C762'
C761'
R757'
C754a'
C757'
C754'
C753'
R750'
R751'
R752'
OFF
ON
REMOTE MUTE
E
D
C
G
S
①
②
③

# EMT 948
# Entzerrer-Verstärker
# EQUALIZER

# Entzerrerverstärker
# EQUALIZER AMPLIFIER

**7 950 038**
with input transformer
(4 150 056), for EMT T-cartridges

**7 950 088**
without input transformer,
for magnetic pickups ( **68 kOhm)



Entzerrer
EQUALIZER
linker Kanal
LEFT CHANNEL
A
B
C
D
Tr. 750
4 150 056
1:7
8
9
C 750
10µ 16V
TA
R 752
470
R 750 12k**
R 751 180k
C 753 100p
C 754 10p
C 757 22p
C 759 100n
+13V
Z 750
1/2 NE 5533 AN
ohne Eingangs-Übertrager für magnetische Tondosen
WITHOUT INPUT-TRANSFORMER FOR MAGNETIC PICK-UP'S
7 950 088 ** 68k
Z_IN = 47kΩ
15k
R 761
C 763 1n
0.1µ
C 761
C 762 0.1µ
Z 751 741
C 764 1n
150k R 759
150k R 760
-13 V
3.3k R 755
220k R 757
R 758 100k
0µs
75µs
R 754 100k
10n C 758
C 756 1.5n
C 755 1.5n
C 752 10µ 16V TA
C 751 10µ 16V TA
R 753 680
10
R 777 470
470 R 753'
C 755' 1.5n
C 756' 1.5n
R 754' 100k
C 758' 10n
75µs
0µs
33k R 755'
220k R 757'
100k R 758'
C 751' 10µ 16V TA
C 752' 10µ 16V TA
mit Eingangs-Übertrager für EMT-T-Tondosen
WITH INPUT-TRANSFORMER FOR EMT-T-PICK-UP'S
7 950 038
1.5 µH L 750'
Tr. 750'
4 150 056
1:7
11
12
C 750' 10µ 16V TA
R 752' 470
R 750' 12k**
R 751' 180k
C 753' 100p
C 754' 10p
Z 750' 1/2 LM 1303
C 757' 22n
R 756' 6.8
C 760' 1n
-11.6 V
D 751' D 752'
2 x 1N4148
C 761' 0.1µ
C'
C 762' 0.1µ
R 759' 150k
Z 751' 741
+13 V
C 763' 1n
C 764' 1n
R 760' 150k
R 761' 15k
D'
rechter Kanal
RIGHT CHANNEL

**Note!**

Circuit diagram left channel shows input amplifier from Ser. No. 48 650. Old version see right channel below.

**Input Amplifier**

## High-Pass

Two-pole. Together with the high-pass network, a rolloff of approx. 20 dB/octave is produced for frequencies below 30 Hz.

**R 777 right adj.** permits compensation for level differences between the channels arising in the pickup cartidge. The gain of the right channel can be varied by approx. ±2 dB.

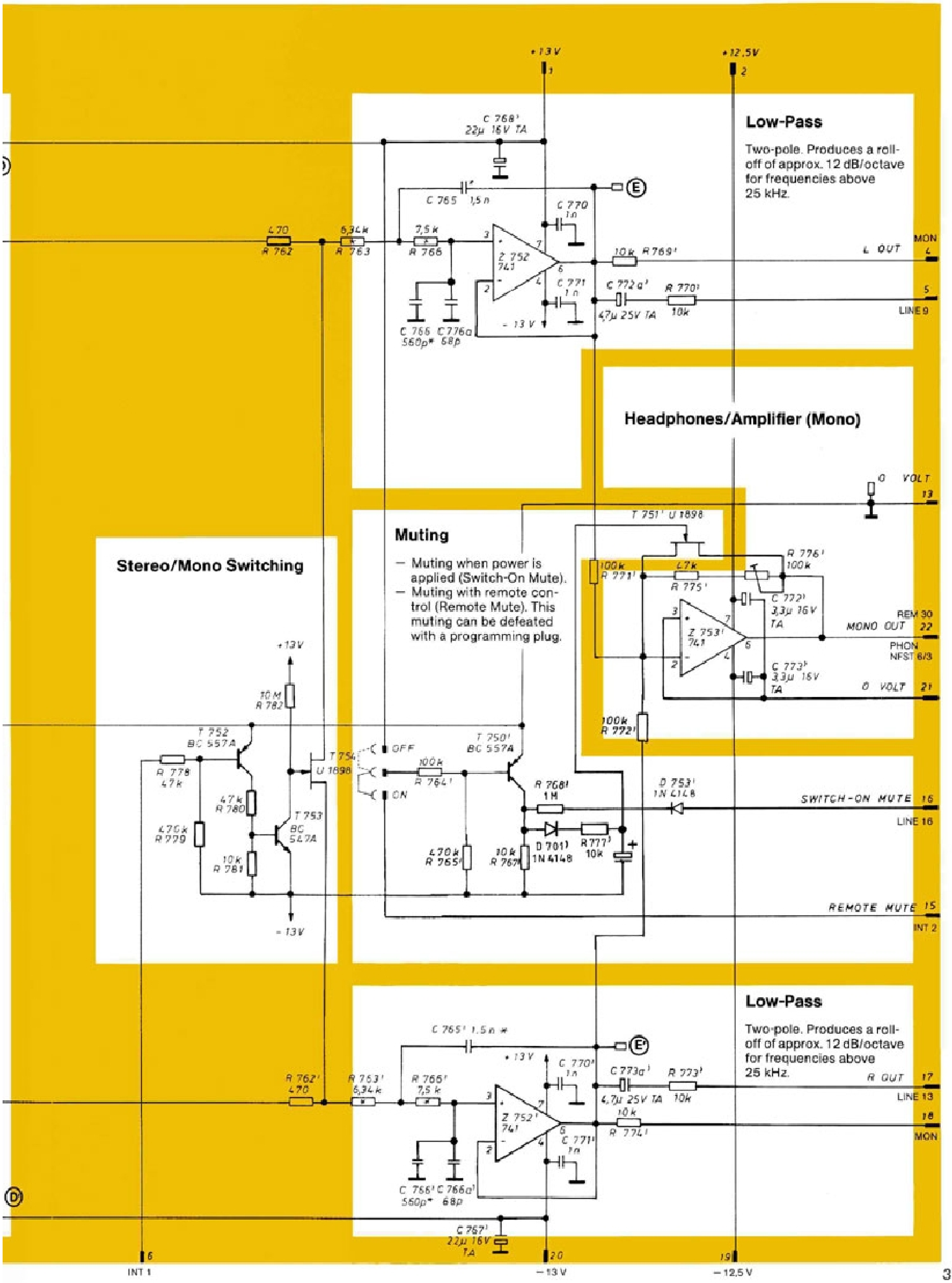
## Time Constants

The time constants for the equalization are determined in the feedback loop of the input amplifier.

The standard reproduction equalization of 75/318/3180 µs can be altered to 0/318/3180 µs (thus eliminating the high-frequency equalization) by changing the positions of the programming plugs.

The low-frequency equalization is calibrated with R 758. This adjustment should not be changed (–3 dB at approx. 30 Hz).

**Input Amplifier**
(see also text for left channel)


+13 V
+12,5 V
C 768'
22µ 16V TA
C 765 1,5 n
E
C 770
1 n
470
R 762
6,34 k
R 763
7,5 k
R 766
Z 752
741
C 771
1 n
-13 V
C 766
560p*
C 776a
68p
10k R 769'
C 772a'
4,7µ 25V TA
R 770'
10k
L OUT
MON 4
5
LINE 9
0 VOLT
13
T 751' U 1898
100k
R 771'
4,7k
R 775'
R 776'
100k
C 772'
3,3µ 16V
TA
Z 753'
741
MONO OUT
REM 30
22
PHON
NFST 6/3
C 773'
3,3µ 16V
TA
0 VOLT
21
100k
R 772'
+13 V
10 M
R 782
T 752
BC 557A
R 778
4,7k
4,7k
R 780
470k
R 779
10k
R 781
T 753
BC 547A
T 754
U 1898
OFF
ON
100k
R 764'
T 750'
BC 557A
R 768'
1 M
D 753'
1N 4148
SWITCH-ON MUTE 16
LINE 16
470k
R 765'
10k
R 767'
D 701'
1N 4148
R 777'
10k
REMOTE MUTE 15
INT 2
-13 V
C 765' 1,5 n *
E'
+13 V
C 770'
1 n
C 773a'
4,7µ 25V TA
R 773'
10k
R OUT 17
LINE 13
R 762'
470
R 763'
6,34 k
R 765'
7,5 k
Z 752'
741
10 k
R 774'
18
MON
C 771'
1 n
C 766'
560p*
C 766a'
68p
D
C 767'
2,2µ 16V
TA
6
INT 1
20
-13 V
19
-12,5 V

## Low-Pass

Two-pole. Produces a roll-off of approx. 12 dB/octave for frequencies above 25 kHz.

## Headphones/Amplifier (Mono)

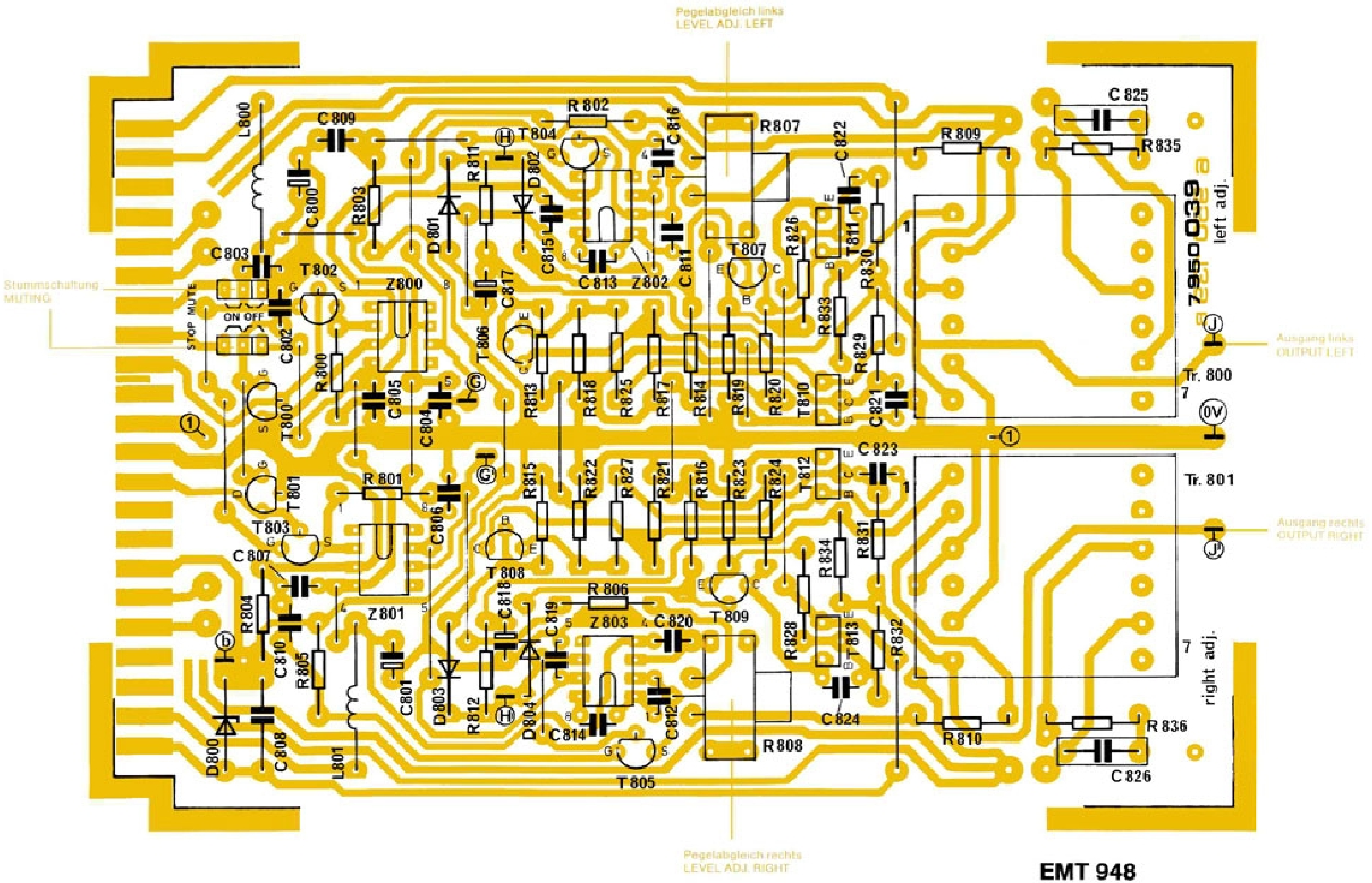
## Muting

- Muting when power is applied (Switch-On Mute).
- Muting with remote control (Remote Mute). This muting can be defeated with a programming plug.

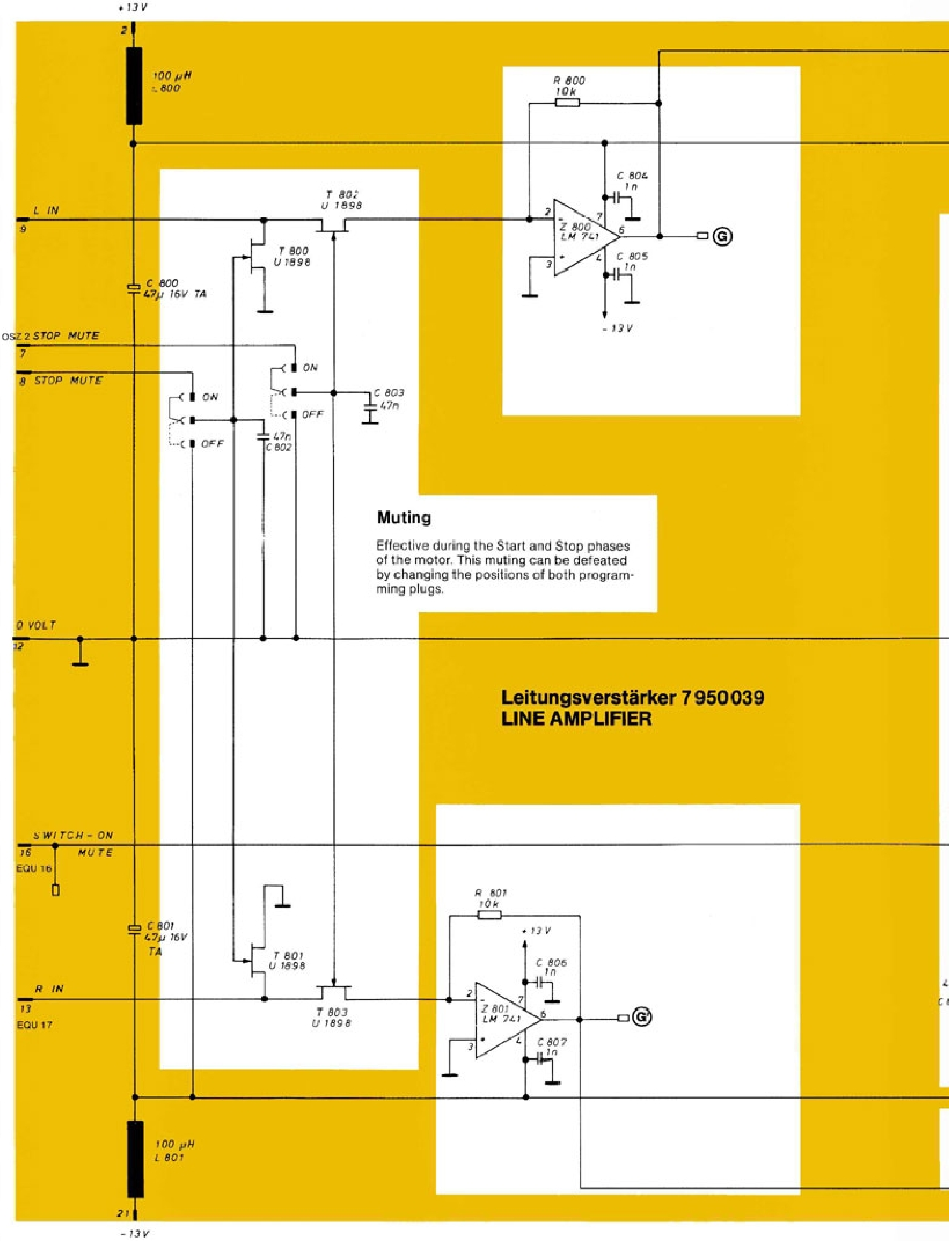
## Stereo/Mono Switching

## Low-Pass

Two-pole. Produces a roll-off of approx. 12 dB/octave for frequencies above 25 kHz.


Pegelabgleich links
LEVEL ADJ. LEFT
Pegelabgleich rechts
LEVEL ADJ. RIGHT
Stummschaltung
MUTING
STOP MUTE
ON OFF
Ausgang links
OUTPUT LEFT
Ausgang rechts
OUTPUT RIGHT
7950 039
left adj.
right adj.
Tr. 800
Tr. 801
0V
1
7
L800
L801
C 800
C 801
C 802
C 803
C 804
C 805
C 806
C 807
C 808
C 809
C 810
C 811
C 812
C 813
C 814
C 815
C 816
C 817
C 818
C 819
C 820
C 821
C 822
C 823
C 824
C 825
C 826
R 800
R 801
R 802
R 803
R 804
R 805
R 806
R 807
R 808
R 809
R 810
R 811
R 812
R 813
R 814
R 815
R 816
R 817
R 818
R 819
R 820
R 821
R 822
R 823
R 824
R 825
R 826
R 827
R 828
R 829
R 830
R 831
R 832
R 833
R 834
R 835
R 836
T 800
T 801
T 802
T 803
T 804
T 805
T 806
T 807
T 808
T 809
T 810
T 811
T 812
T 813
D 800
D 801
D 802
D 803
D 804
Z 800
Z 801
Z 802
Z 803
G
H
J
b
①

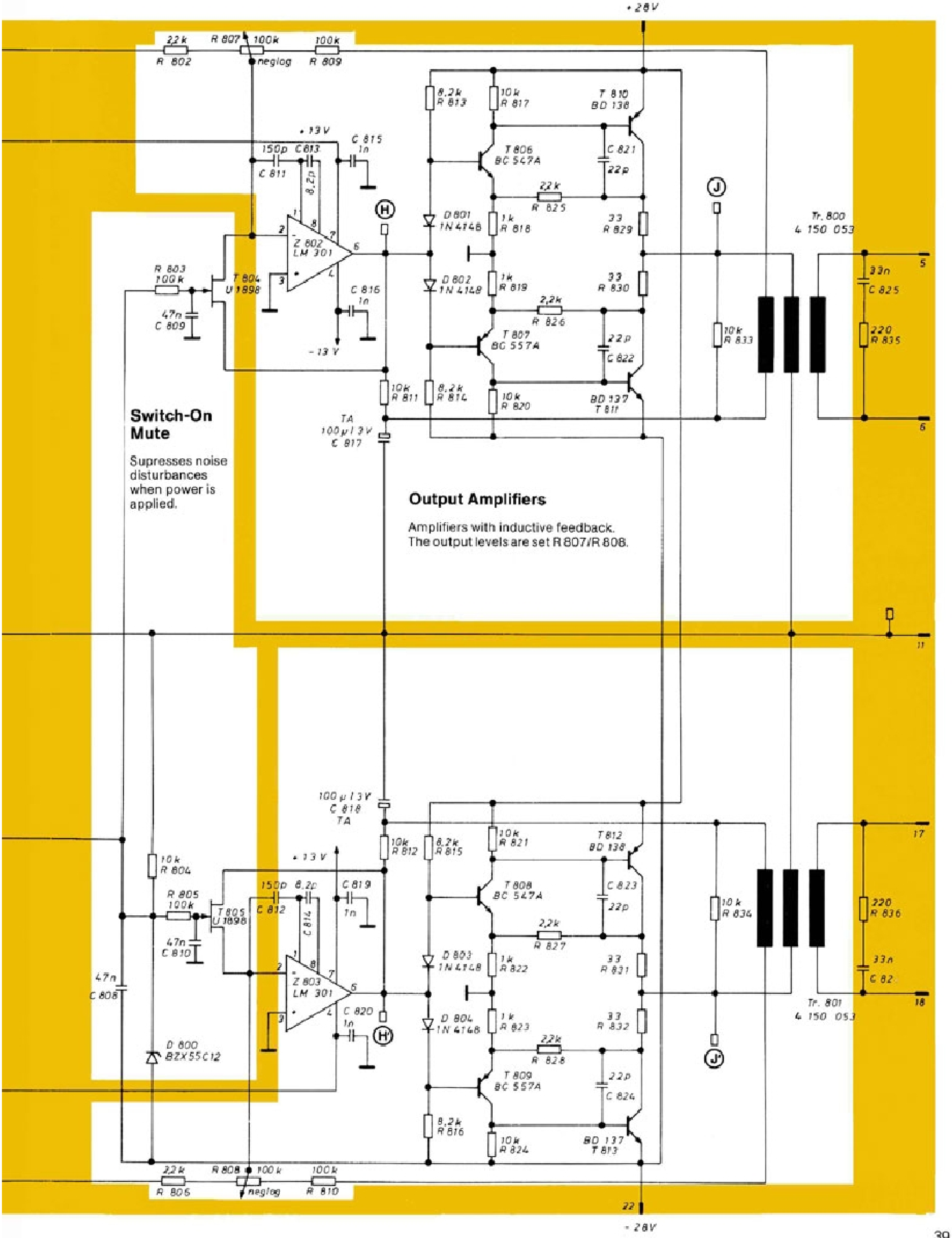
**EMT 948**
**Leitungsverstärker**
**LINE AMPLIFIER**


+13 V
2
100 µH
L 800
R 800
10k
C 804
1n
T 802
U 1898
L IN
9
Z 800
LM 741
2
7
6
3
4
G
T 800
U 1898
C 805
1n
C 800
47µ 16V TA
-13 V
OSZ 2 STOP MUTE
7
ON
8 STOP MUTE
C 803
47n
ON
OFF
OFF
47n
C 802
0 VOLT
12
SWITCH - ON
16
MUTE
EQU 16
R 801
10k
C 801
47µ 16V
TA
+13 V
C 806
1n
T 801
U 1898
R IN
13
EQU 17
T 803
U 1898
Z 801
LM 741
2
7
6
3
4
C 807
1n
G
100 µH
L 801
21
-13 V

## Muting

Effective during the Start and Stop phases of the motor. This muting can be defeated by changing the positions of both programming plugs.

## Leitungsverstärker 7950039
## LINE AMPLIFIER



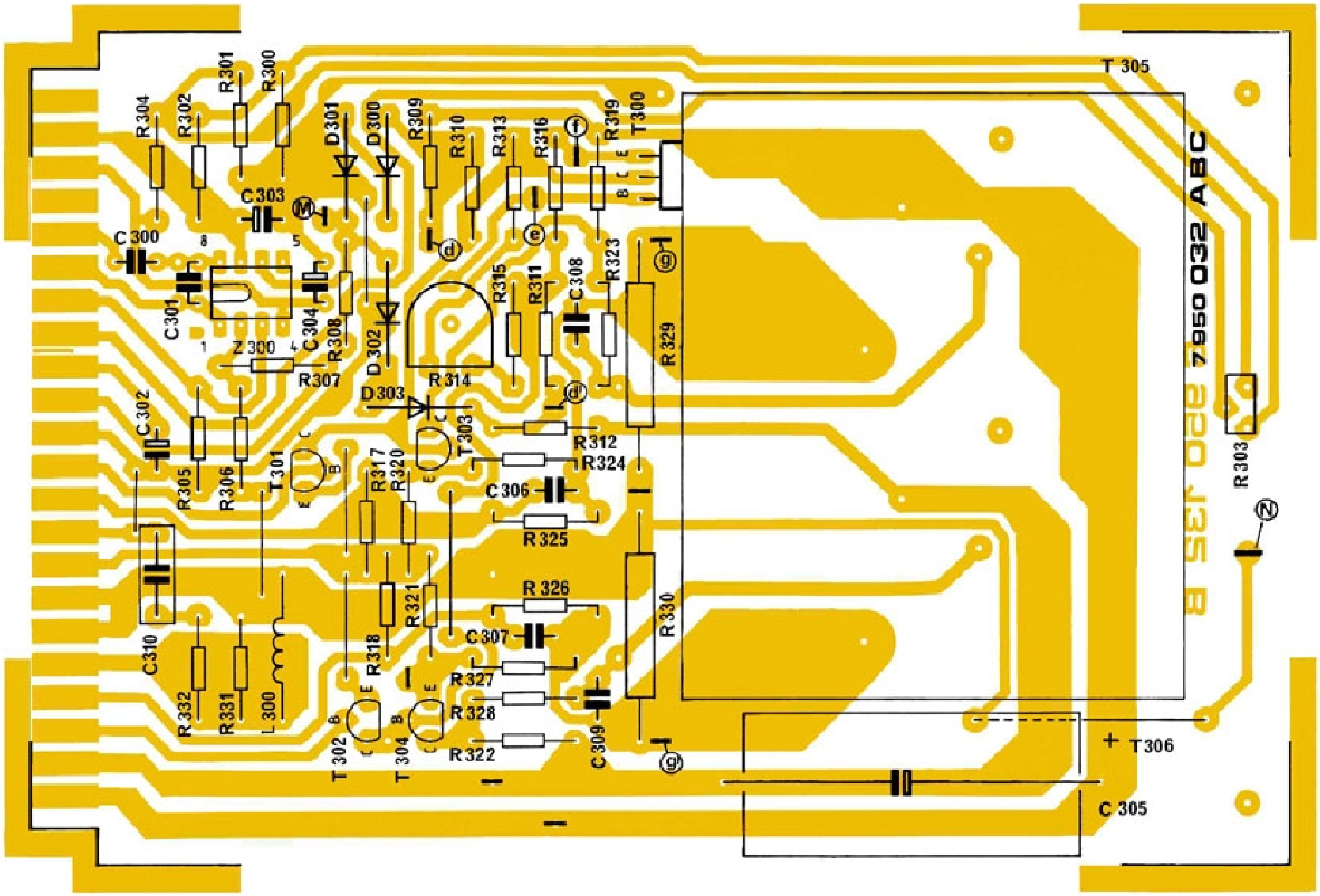
## Switch-On Mute

Supresses noise disturbances when power is applied.

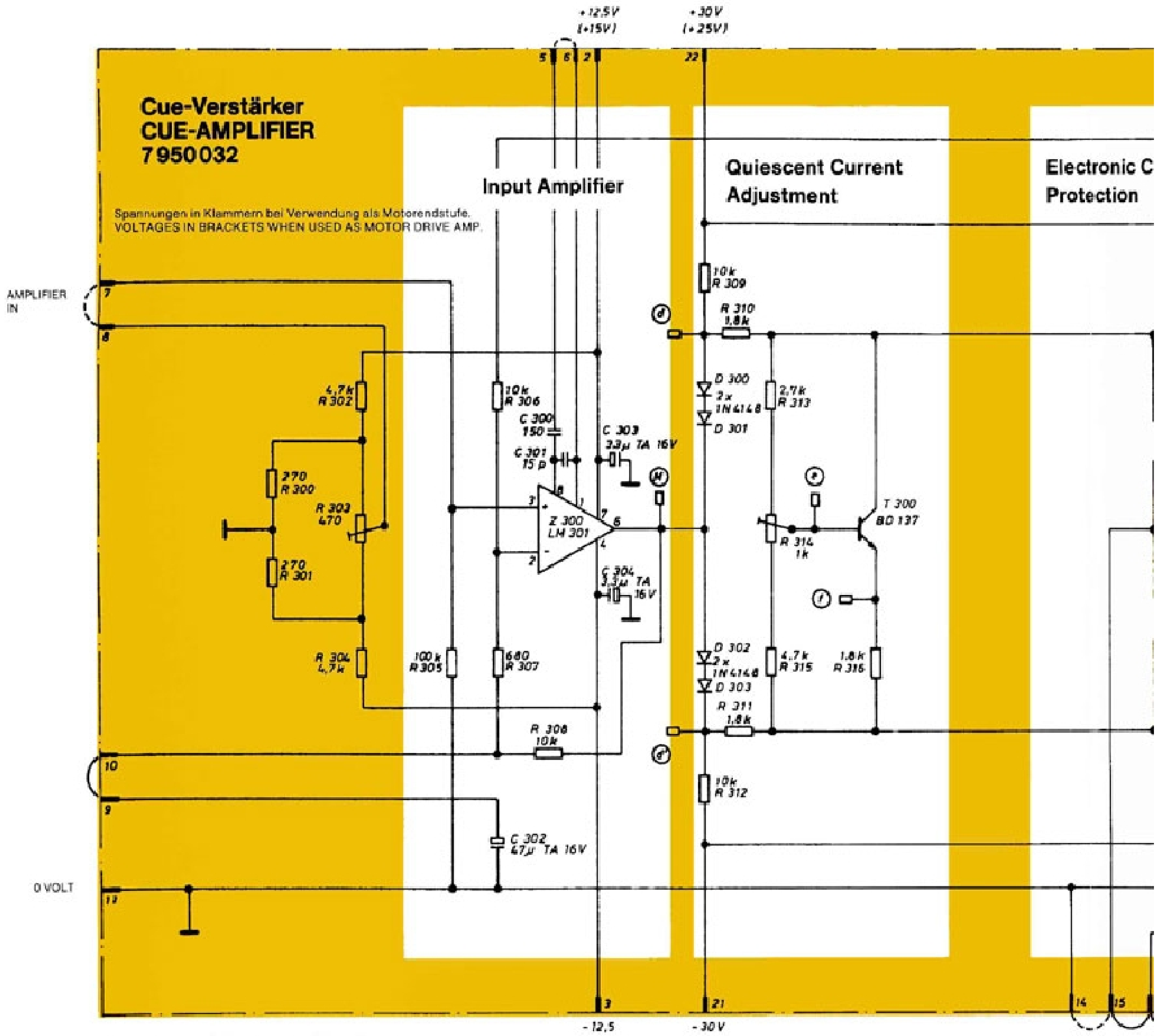
## Output Amplifiers

Amplifiers with inductive feedback. The output levels are set R 807/R 808.

+28V
2,2 k
R 802
R 807
100k
neglog
100 k
R 809
+13 V
150p
C 811
C 813
8,2p
C 815
1n
Z 802
LM 301
T 804
U 1898
R 803
100 k
47n
C 809
C 816
1n
-13 V
H
8,2 k
R 813
10 k
R 817
T 810
BD 138
T 806
BC 547A
C 821
22p
2,2 k
R 825
D 801
1N 4148
1 k
R 818
33
R 829
D 802
1N 4148
1 k
R 819
33
R 830
2,2 k
R 826
T 807
BC 557A
22p
C 822
10 k
R 811
8,2 k
R 814
10 k
R 820
BD 137
T 811
TA
100 µ 13 V
C 817
J
10 k
R 833
Tr. 800
4 150 053
33n
C 825
220
R 835
5
6
11
100 µ 13 V
C 818
TA
10 k
R 812
8,2 k
R 815
10 k
R 821
T 812
BD 138
T 808
BC 547A
C 823
22p
10 k
R 804
R 805
100 k
T 805
U 1898
150p
C 812
8,2p
C 814
C 819
1n
47n
C 810
2,2 k
R 827
D 803
1N 4148
1 k
R 822
33
R 831
Z 803
LM 301
47n
C 808
C 820
1n
H'
D 804
1N 4148
1 k
R 823
33
R 832
10 k
R 834
J'
220
R 836
33n
C 826
17
18
Tr. 801
4 150 053
D 800
BZX 55 C12
2,2 k
R 828
T 809
BC 557A
2,2p
C 824
8,2 k
R 816
10 k
R 824
BD 137
T 813
2,2 k
R 806
R 808
100 k
neglog
100 k
R 810
22
-28 V


T 305
7 950 032 ABC
R 303
T 306
C 305
R 304
R 302
R 301
R 300
D 301
D 300
R 309
R 310
R 313
R 316
R 319
T 300
C 300
C 303
C 301
C 304
R 308
D 302
Z 300
R 307
D 303
R 314
R 315
R 311
C 308
R 323
R 329
R 330
R 312
R 324
C 306
R 325
R 326
C 307
R 327
R 328
R 322
C 309
C 302
R 305
R 306
T 301
T 303
R 317
R 320
R 321
R 318
T 302
T 304
C 310
R 332
R 331
L 300

**EMT 948**
**Cue-Verstärker**
**CUE AMPLIFIER**

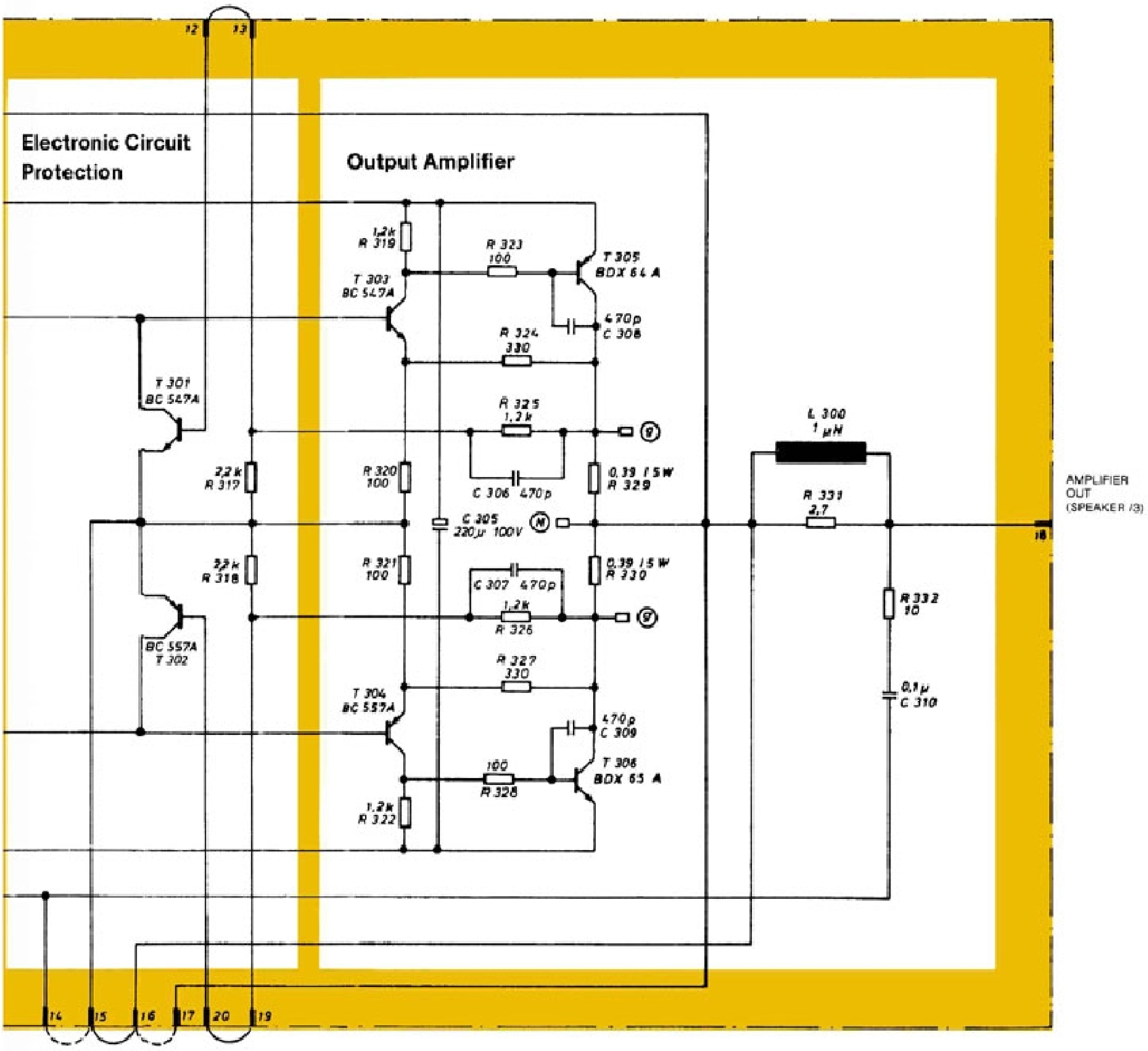

Cue-Verstärker
CUE-AMPLIFIER
7950032
Spannungen in Klammern bei Verwendung als Motorendstufe.
VOLTAGES IN BRACKETS WHEN USED AS MOTOR DRIVE AMP.
Input Amplifier
Quiescent Current Adjustment
Electronic C
Protection
+12,5V
(+15V)
+30V
(+25V)
-12,5
(-15V)
-30V
(-25V)
AMPLIFIER IN
0 VOLT
5
6
2
22
7
8
10
9
11
3
21
14
15
4,7k R 302
270 R 300
R 303 470
270 R 301
R 304 4,7k
100k R 305
10k R 306
C 300 150
C 301 15p
680 R 307
R 308 10k
C 302 47µ TA 16V
C 303 3,3µ TA 16V
C 304 3,3µ TA 16V
Z 300 LM 301
10k R 309
R 310 1,8k
D 300 2x 1N4148 D 301
2,7k R 313
R 314 1k
T 300 BD 137
D 302 2x 1N4148 D 303
4,7k R 315
1,8k R 316
R 311 1,8k
10k R 312
d
h
e
f
g

Brücken bei Verwendung als Verstärker.
CONNECTED WHEN USED AS AMPLIFIER (DRIVE C).

Brücken bei Verwendung als Motor-Endstufe.
CONNECTED WHEN USED AS MOTOR DRIVE AMPLIFIER (DRIVE A, B).

## R 314 Adjust

- Short the input to 0 V.
- Adjust R 314 fo a voltage drop of approx. 20 mV over R 329 and R 330. (between test pin g and g')

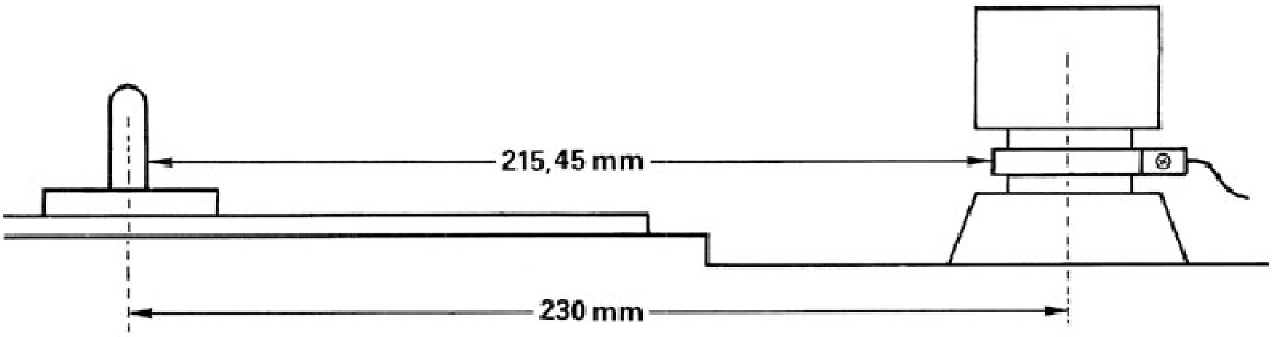

12
13
Electronic Circuit
Protection
Output Amplifier
1,2k
R 319
R 323
100
T 305
BDX 64 A
T 303
BC 547A
470p
C 308
R 324
330
T 301
BC 547A
R 325
1,2k
⑨
2,2k
R 317
R 320
100
C 306 470p
0,39 15W
R 329
C 305
220μ 100V
Ⓜ
L 300
1 μH
R 331
2,7
AMPLIFIER
OUT
(SPEAKER /3)
18
2,2k
R 318
R 321
100
C 307 470p
0,39 15W
R 330
1,2k
R 326
⑨
R 332
10
BC 557A
T 302
R 327
330
T 304
BC 557A
470p
C 309
0,1μ
C 310
100
R 328
T 306
BDX 65 A
1,2k
R 322
14
15
16
17
20
19

# Service

## Mechanical Adjustments

The Broadcast Turntable is simple to adjust mechanically.

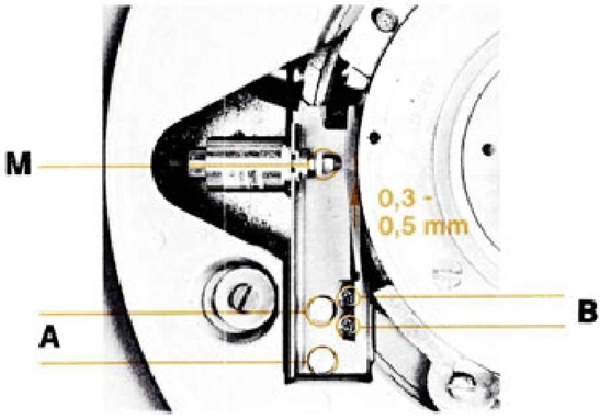
1. If a replacement motor or tone arm mounting board is installed, a distance of 230 mm must be set between the motor spindle and the tone arm shaft. This adjustment may be made most readily with reference to the distance of 215.45 mm shown in the diagram.



2. BRAKE

The brake is mounted underneath the turntable platter. It is adjusted so that a "parallel" separation of approx. 0.3 - 0.5 mm is present between the brake shoe and the rotor of the motor when the turntable is running. If necessary, the brake is to be readjusted as follows:

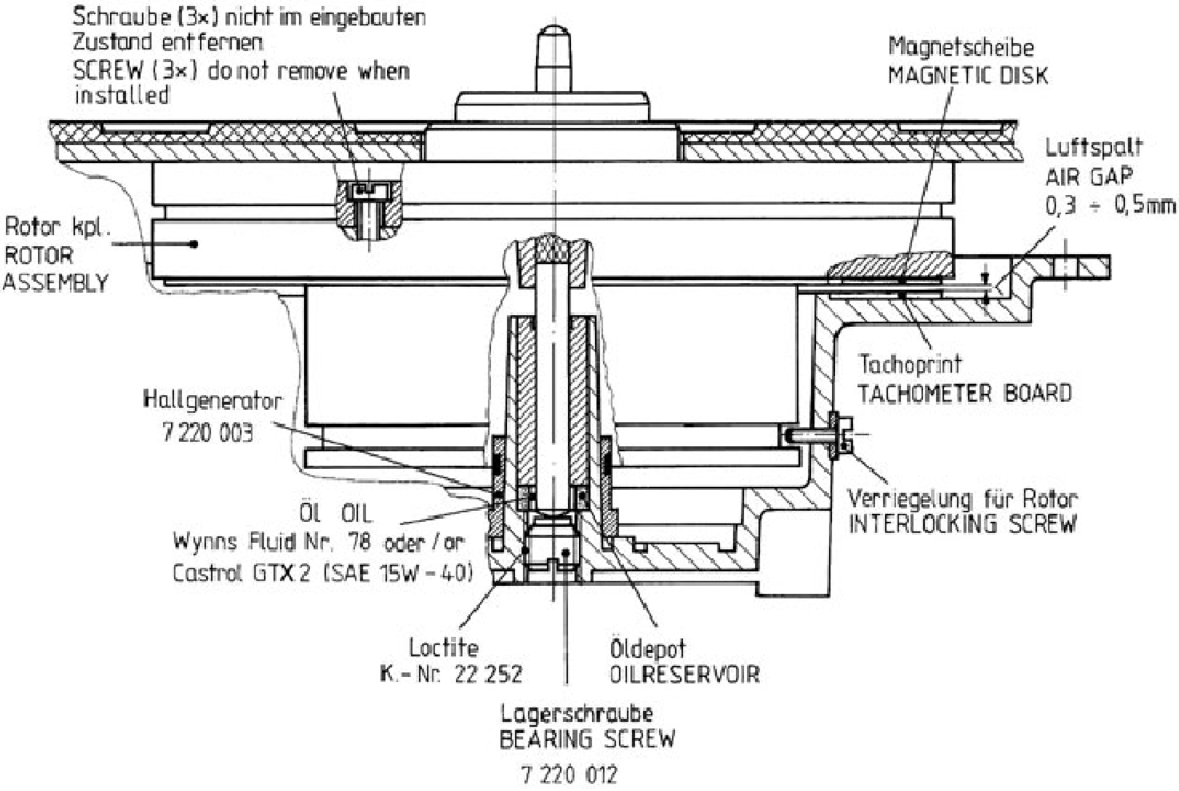
- Unscrew screws "A" and remove the brake.
- Adjust nut "M" to achieve a brake travel of approx. 2 mm, that is, the shaft of the brake should exhibit a free play of approx. 2 mm.
- Align the brake shoe at Philips screws "B" along the metal edge lying underneath.
- Align the entire brake assembly to achieve a "parallel" separation of approx. 0.3 - 0.5 mm between the brake shoe and the rotor of the motor when the mains power is turned off. Tighten screws "A".



## 3. MOTOR

The controlled DC motor employs Hall generator communication.

The diagram illustrates the principle of construction. The rotor shaft extending through the unit is guided by a sintered bearing. The rounded end of the rotor shaft turns on a bearing disk made of Nylatron.


Schraube (3×) nicht im eingebauten Zustand entfernen
SCREW (3×) do not remove when installed
Magnetscheibe
MAGNETIC DISK
Luftspalt
AIR GAP
0,3 ÷ 0,5mm
Rotor kpl.
ROTOR ASSEMBLY
Tachoprint
TACHOMETER BOARD
Hallgenerator
7 220 003
Verriegelung für Rotor
INTERLOCKING SCREW
Öl OIL
Wynns Fluid Nr. 78 oder / or
Castrol GTX 2 (SAE 15W - 40)
Loctite
K.- Nr. 22 252
Öldepot
OILRESERVOIR
Lagerschraube
BEARING SCREW
7 220 012

The running height of the rotor is adjusted at the factory with the lower bearing screw (7 220 012), resulting in an air gap of 0.3 to 0.5 mm between the magnetic disk secured to the rotor and the stationary board containing the tachometer coil.

In this manner, a corresponding voltage level is obtained at the amplifier output of 12 to 13 $V_{pp}$ at 33-1/3 rpm.

The position of this bearing screw (secured with Loctite) should normally NOT be changed.

The rotor of the motor is protected from falling out by a screw on the stator housing, situated externally next to the motor number.

When the motor or shaft is to be inspected, only this one screw (sealed with green paint) should be loosened several turns. The complete rotor assembly may then be removed by pulling upwards.

CAUTION! Because of the strong magnetic forces present, exercise extreme care during removal and replacement.

The three M4 screws in the upper part of the rotor must therefore not be loosened. They are employed for screwing the heavy magnet unit to the rotor plate.

Loosening the screws presents the danger of destroying the Hall generator elements located below.

The bearing of the motor is permanently lubricated with special oil (15 drops):
WYNNS Fluid No. 78, or
CASTROL GTX 2 (SAE 15 W - 40)

Below the end of the sintered bearing, an oil reservoir is located that has no direct contact with the rotor shaft.

The elements of the Hall generators (7 220 003) exhibit an ohmic resistance of between 30 and 50 Ohms (approx.), depending on the position of the rotor.

Testing may be conducted, for example, at the soldering terminals of the connection board directly below the motor (between the current conductors H 4/H 1 or H 4/H 6, respectively, and the remaining voltage conductors).

The complete Hall generator element may be replaced, if necessary, as follows:

- Unsolder the eight connections leading to the center of the motor from below. (Do not unscrew the connection board.)
- Remove the rotor completely (after loosening the interlocking screw, as described above).
- Push in a new element precisely to the stop and solder the connections on the circuit board.
- Reassemble the motor.
- Readjust the motor amplifier as described in the instruction manual.

# Technical Data

# EMT 948

## Deck

| | |
|---|---|
| Turntable diameter | 33 cm |
| Turntable speeds | 33-1/3 rpm<br>45 rpm<br>78 rpm |
| Deviation of turntable speed | max. 0.1 % (quartz controlled) |
| Speed variation with VCO operation | ±25 % |
| Run-up time at $T_{amb.} = 20$ °C<br>Quick start<br>Test at TP 6 from f/u-converter "Tacho" | max. 200 ms |
| Wow and flutter at 33-1/3 rpm | |
| measured with EMT 424 weighted in accordance with DIN 45 507 | max. ±0.075 % |
| Rumble | |
| measured according to DIN 45 539 with test record DIN 45 544 | |
| min. unweighted | 50 dB |
| min. weighted | 70 dB |
| Mains Voltage | |
| 50 or 60 Hz | 100, 110, 120, 220, 230, 240 V (+5, −10 %) |
| Power consumption | max. approx. 85 VA<br>normal approx. 40 VA |
| Operating temperature | +10 . . . +60 °C |
| Relative humidity | 20 . . . 90 % RH, non-condensing |
| Dimensions | 460 mm (18.3")<br>475 mm (18.9")<br>235 mm ( 9.4") |
| Depth below mounting surface | 157 mm (6.2") |
| Weight | 26 kg (58 lbs) |

## Tone Arm

EMT 929 Tone Arm for EMT "T" series pickup cartridges.

| | |
|---|---|
| Tracking force | adjustable 0-50 mN<br>(0-5 g) |
| Antiskating device | compensating weight |
| Bearing friction | |
| horizontal and vertical | max. 5 x $10^{-4}$ N(50 mg) |
| Tone arm lift, motor driven | |
| raising and lowering time adjustable | approx. 0.2 s |
| Empty headshell | for mounting standard magnetic pickup cartridges |

Subject to change without notice.

## Pick-up cartridges

**"T" series** (stereo and mono)

| Type | TSD 15 | TMD 25 | TND 65 |
|---|---|---|---|
| Application | Stereo<br>Stereo grooves | Mono<br>Microgrooves | Mono<br>Standard grooves |
| Stylus | Diamond Super Fineline shape | Diamond conical | Diamond conical |
| Tip radius | 6 µm | 25 µm | 65 µm |
| Tracking force | 20 - 30 mN | 20 - 30 mN | 20 - 30 mN |
| Output level at 1 kHz (for 1 cm/s rms recorded velocity | 0.21 mV ±2 dB | 0.21 mV ±2 dB | 0.21 mV ±2 dB |
| Frequency range | 20 Hz - 30 kHz | 20 Hz - 20 kHz | 20 Hz - 20 kHz |
| Frequency response 40 Hz - 12.5 kHz | ±2 dB | ±2 dB | ±2 dB |
| Difference in output level between channels 40 Hz - 12.5 kHz | max. 2 dB | - | - |
| Crosstalk at 1 kHz | min. 25 dB | - | - |
| Frequency intermodulation (FIM) | max. 0.5 % | max. 1 % | max. 1 % |
| Vertical tracking angle | 18° (±3°) | 18° (±3) | 18° (±3°) |
| DC resistance | 2 x 24 ohms | 24 ohms | 24 ohms |
| Compliance | 15 µm/mN | 15 µm/mN | 15 µm/mN |
| Equivalent mass at stylus tip | approx. 1 mg | approx. 1 mg | approx. 1 mg |

The above data were obtained using the following test records:

Frequency response and crosstalk test record DIN 45 543

Distortion test record DIN 45 542

Distortion measurements performed with test record DIN 45 542 referred to "reference level - 6 dB" ≙ full modulation (peak velocity 8 cm/s at 1 kHz)

**Note:** The stylus assemblies are not user replaceable.

Subject to change without notice.

# Technical Data

# EMT 948

## Amplifiers

| | |
|---|---|
| Plug-in boards | |
| Equalization | |
| DIN, NAB, IEC | 75/318/3180 µs |
| FLAT | 0/318/3180 µs,<br>selected with programming plug |
| Frequency response | 40 Hz to 15 kHz ±0.5 dB<br>30 Hz approx. −3 dB<br>below 30 Hz approx. 20 dB/octave rolloff<br>above 25 kHz approx. 12 dB/octave rolloff |
| Input voltage | |
| for EMT "T" cartridges | 0.3 to 1.4 mV (with 1:7 input transformer) |
| for magnetic cartridges ($R_i$ = 47 kohms) | 2 to 10 mV |
| Overload margin of the input | 20 dB |
| Maximum output level before clipping | 10 V (+ 22 dB) |
| Output voltage | adjustable between 700 mV and 10 V (0 to +22 dB) on 200 ohms |
| Harmonic distortion | max. 0.1 % between 30 Hz and 12 kHz at 4:4 V (+ 15 dB) on 200 ohms |
| Crosstalk supression | min. 55 dB, 30 Hz to 15 kHz |
| RMS S/N ratio, unweighted | min. 75 dB |
| Peak S/N ratio, weighted (CCIR 468-2) | min. 67 dB |
| Headphone output, mono | unbalanced, adjustable |
| Headphone output, stereo | unbalanced, adjustable |
| on a load of 200 ohms | approx. 200 to 600 mV |
| on a load of 2 kohms | approx. 500 to 1500 mV |
| Mono switching | operable by remote control |

Subject to change without notice.

# EMT 948 Information for Ordering

| Types | Quantity | Order No. | Name |
|---|---|---|---|
| | 1 | 9 948 110/... | Turntable deck, complete, with EMT 929 Tone Arm, Equalizer Amplifier, without pickup cartridge |
| | 1 | 9 948 120/... | Turntable deck, complete, with EMT 929 Tone Arm, TSD-G Pickup Shell, and 47 kohms equalizer amplifier, for magnetic pickup cartridges |
| | | /... | **Please indicate desired mains voltage.** |

**Additional versions** 9 948 . . .

1 Cue amplifier with level control, 6.3 mm stereo phone jack on control panel

1 Equalizer amplifier for TSD Pickup Cartridges
2 47 kohms equalizer amplifier with TSD-G empty pickup shell for mounting magnetic cartridges

5 with additional cartridge illumination
6 with additional, simplified transport lock (e.g., for mobile vans)
7 with additional cartridge illumination and transport lock

| Parts List | Quantity | Order No. | Name |
|---|---|---|---|
| | 1 | 9 935 006 | Empty EMT Pickup Shell T-series with accessories for 9 948 120 |
| | 1 | 7 948 030 | Dust cover assembly |
| | 1 | 6 948 036 | Turntable platter assembly |

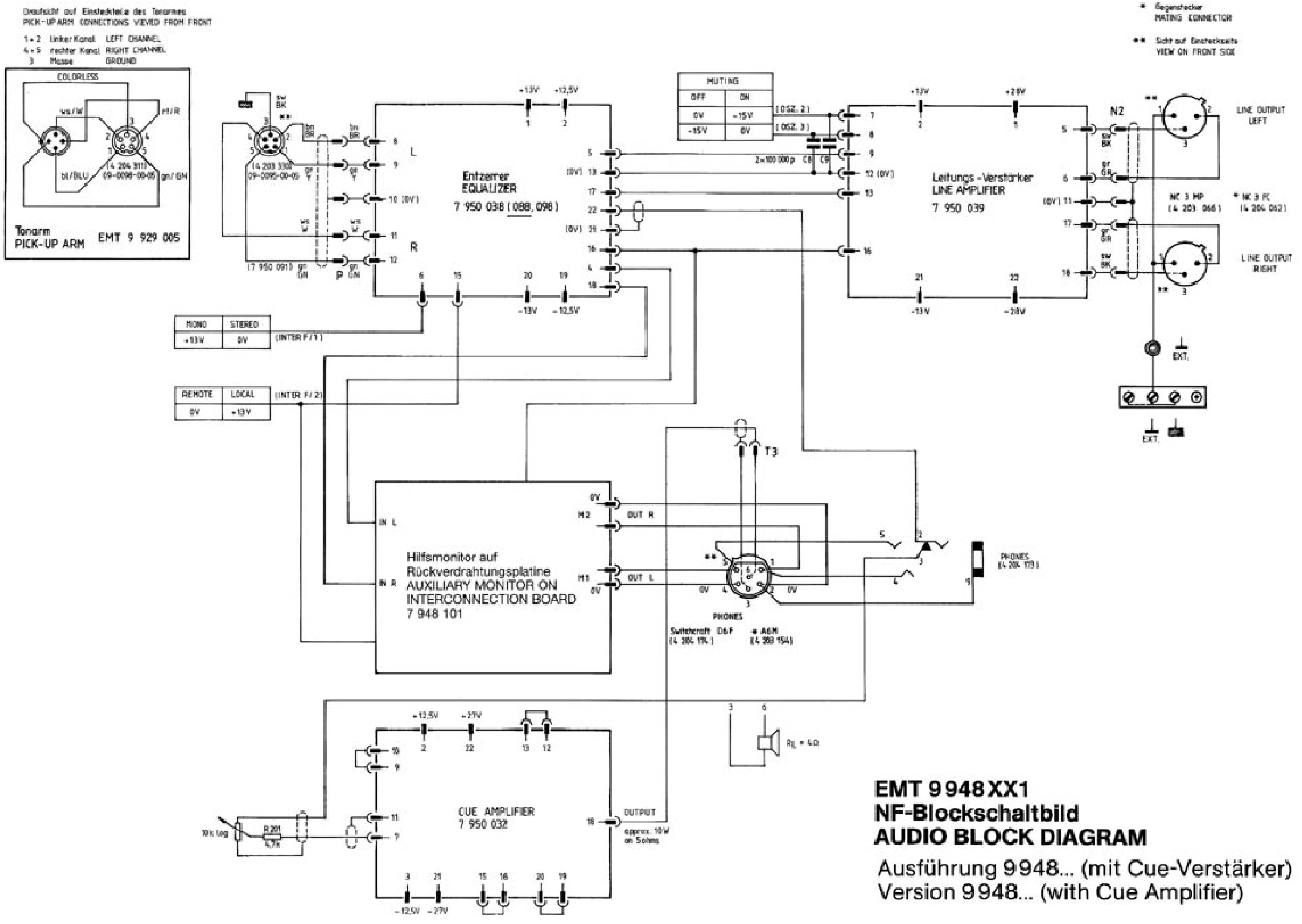
| Accessories | Quantity | Order No. | Name |
|---|---|---|---|
| | 1 | 4 203 154 | Male plug, 6 pin (type A6M) |
| | 1 | 4 203 234 | Male plug, 36 pin (type Amphenol 57-30360) |
| | 2 | 4 204 062 | Female plug, 3 pin (type NC-3FX) |
| | 1 | 4 240 579 | Mains cable, german standard |
| | 1 | 4 240 580 | Mains cable, USA |
| | 1 | 4 295 001 | Allen key, 2 mm |
| | 1 | 4 295 002 | Allen key, 3 mm |
| | 1 | 6 929 100 | Tone arm height adjustment gauge |
| | 1 | 7 948 100 | Set of fuses and lamps: |
| | 3 | 4 107 008 | Incandescent lamp 18 V / 26 mA |
| | 2 | 4 190 050 | Fuse 1.0 AT / 250 V USA |
| | 2 | 4 190 051 | Fuse 0.5 AT / 250 V USA |
| | 2 | 4 190 100 | Fuse 0.5 AT / 250 V EUR |
| | 2 | 4 190 103 | Fuse 1.0 AT / 250 V EUR |
| | 1 | 4 191 069 | Fuce cap EUR |
| | 1 | 4 191 070 | Fuce cap USA<br>(One fuse and one fuse cap installed as mains fuse). |
| | 1 | 7 929 055 | Antiscating weight, in bag |
| | 1 | 6 929 016 | Counterweight |
| | 1 | 6 950 060 | Stroboscope disk |
| | 1 | 4 107 009 | Lamp removal tool |

| Special Accessories (to be ordered separately) | Quantity | Order No. | Name |
|---|---|---|---|
| | 1 | 9 948 970 | Console, operating height 800 mm, vertically adjustable feet ± 25 mm, with cover plate for mounting additional control elements or loudspeakers. |
| | 1 | 9 948 971 | Console, operating height 800 mm, vertically adjustable feet ± 25 mm, with cue amplifier and cue loudspeaker, cover plate for mounting additional control elements. |
| | 1 | 948 910 | Transport Trunk |
| | 1 | 9 935 000 | TSD 15 Stereo pickup cartridge with 6 μm Super Fineline Stylus. |
| | 1 | 9 935 001 | TMD 25 Mono pickup cartridge with 25 μm diamond stylus for microgroove records. |
| | 1 | 9 935 002 | TND 65 Mono pickup cartridge with 65 μm diamond stylus for 78 rpm standard records. |

# Recommended Spare Parts

The numbers quoted are intended for 5 years' operation. Fractions indicate that we recommend only one spare part where several turntables are operated together. Example: 1/3 = 1 spare part for 3 machines.

| Recommended Quantity | Order No. | Name |
|---|---|---|
| 2 | 4 107 005 | Cold cathode lamp |
| 3 | 4 107 008 | Incandescent lamp, 18 V / 26 mA |
| 2 | 4 190 050 | Fuse, 1 A slow-blow, 250 V USA |
| 2 | 4 190 051 | Fuse, 0.5 A slow-blow, 250 V USA |
| 2 | 4 190 100 | Fuse, 0.5 A slow-blow, 250 V EUR |
| 2 | 4 190 103 | Fuse, 1 A slow-blow, 250 V EUR |
| 1/3 | 9 220 000 | Motor assembly, complete |
| 1 | 7 950 010 | Lift motor, complete |
| 2 | 6 832 070 | Drive belt for tone arm lift |
| 1/5 | 9 929 005 | Tone arm |
| 1/5 | 7 950 038 | Stereo equalizer amplifier for TSD cartridges |
| 1/5 | 7 950 088 | Stereo equalizer amplifier, 47 kohms |
| 1/5 | 7 950 039 | Line amplifier |
| 1/5 | 7 948 105 | Servo amplifier board |
| 1/5 | 7 948 106 | Speed control board |
| 1/5 | 7 948 107 | Oscillator board |
| 1/5 | 7 948 108 | Interface board |
| 1/5 | 7 950 037 | Amplifier power supply |
| 1/5 | 7 948 110 | Power supply board |
| 1/5 | 7 948 030 | Dust cover, complete |


Draufsicht auf Einsteckteile des Tonarmes
PICK-UP ARM CONNECTIONS VIEWED FROM FRONT
1 + 2 Linker Kanal LEFT CHANNEL
4 + 5 rechter Kanal RIGHT CHANNEL
3 Masse GROUND
COLORLESS
ws/W
rt/R
bl/BLU
gn/GN
(4 204 311)
09-0090-00-05
Tonarm
PICK-UP ARM
EMT 9 929 005
sw BK
br BR
ge Y
ws W
gn GN
(4 203 330)
09-0095-00-05
(7 950 091)
P
L
R
10 (0V)
Entzerrer
EQUALIZER
7 950 038 (088, 098)
+13V
+12,5V
-13V
-12,5V
(0V)
MONO
STEREO
+13V
0V
(INTER F/1)
REMOTE
LOCAL
0V
+13V
(INTER F/2)
MUTING
OFF
ON
0V
-15V
-15V
0V
(OSZ. 2)
(OSZ. 3)
2x100 000 p
C8
C9
12 (0V)
Leitungs-Verstärker
LINE AMPLIFIER
7 950 039
+13V
+28V
-13V
-28V
(0V) 11
NZ
sw BK
gr GR
NC 3 MP
(4 203 060)
* NC 3 FC
(4 204 062)
LINE OUTPUT LEFT
LINE OUTPUT RIGHT
* Gegenstecker
MATING CONNECTOR
** Sicht auf Einsteckseite
VIEW ON FRONT SIDE
EXT.
EXT.
Hilfsmonitor auf
Rückverdrahtungsplatine
AUXILIARY MONITOR ON
INTERCONNECTION BOARD
7 948 101
IN L
IN R
0V
M2
M1
OUT R
OUT L
T3
PHONES
Switchcraft D6F
+ A&M
(4 204 114)
(4 200 154)
PHONES
(4 204 173)
R_L = 4Ω
CUE AMPLIFIER
7 950 032
+13,5V
+27V
-12,5V
-27V
OUTPUT
approx. 10W
an 5 ohms
R 201
4,7k
10k log

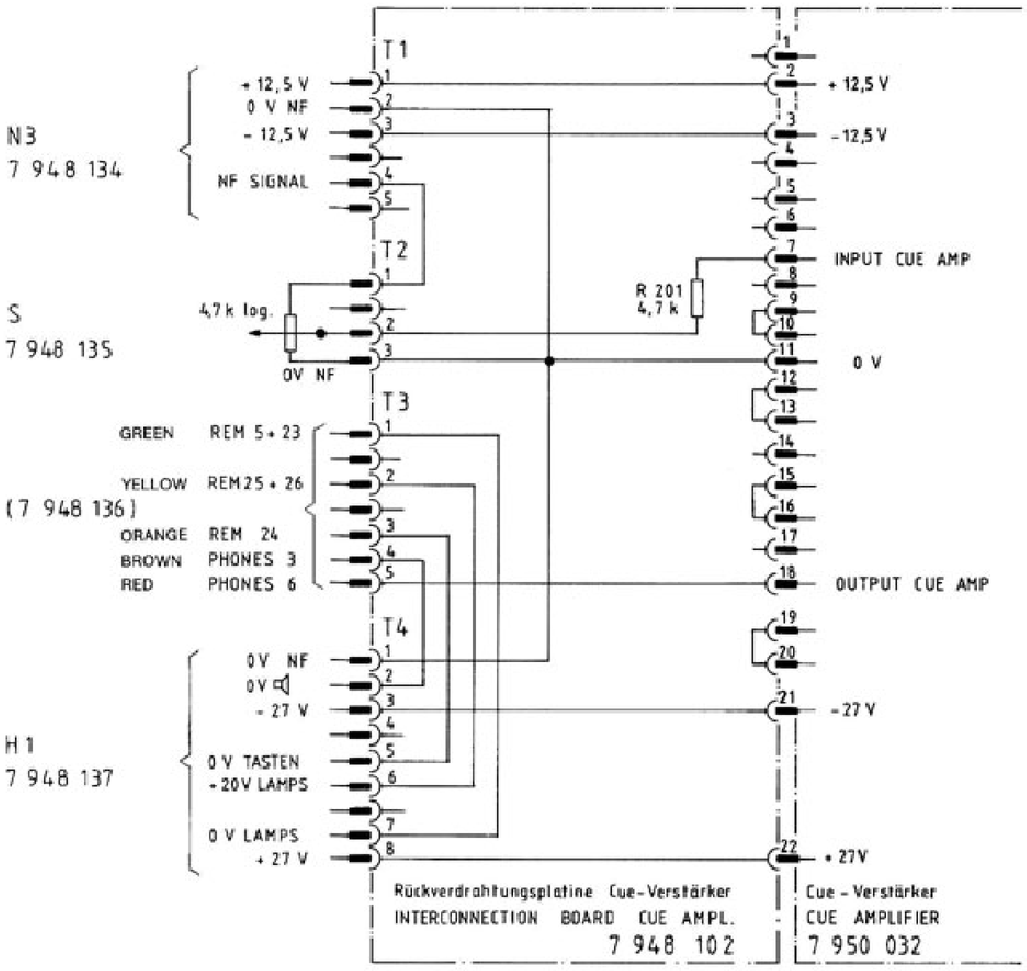
EMT 9948XX1

NF-Blockschaltbild

AUDIO BLOCK DIAGRAM

Ausführung 9948... (mit Cue-Verstärker)

Version 9948... (with Cue Amplifier)


T1
T2
T3
T4
N3
7 948 134
+ 12,5 V
0 V NF
- 12,5 V
NF SIGNAL
S
7 948 135
4,7 k log.
0V NF
GREEN
REM 5 + 23
YELLOW
REM25 + 26
(7 948 136)
ORANGE
REM 24
BROWN
PHONES 3
RED
PHONES 6
H 1
7 948 137
0 V NF
0 V
- 27 V
0 V TASTEN
- 20V LAMPS
0 V LAMPS
+ 27 V
R 201
4,7 k
+ 12,5 V
- 12,5 V
INPUT CUE AMP
0 V
OUTPUT CUE AMP
- 27 V
+ 27V
Rückverdrahtungsplatine Cue-Verstärker
INTERCONNECTION BOARD CUE AMPL.
7 948 102
Cue - Verstärker
CUE AMPLIFIER
7 950 032

## Rückverdrahtungsplatine
## Option Cue-Verstärker

## INTERCONNECTION BOARD
## OPTION CUE AMPLIFIER

## X 948 901

# Ersatzteilliste/Replacement Parts EMT 948

| BEST.-NR. ORDER NO. | BEZEICHNUNG | DESIGNATION |
|---|---|---|
| 4 107 005 | Kaltlichtlampe | Cold-cathode lamp |
| 4 107 008 | Glühlampe 18 V / 26 mA | Pilot lamp 18 V / 26 mA |
| 4 190 050 | Sicherung 1 AT/250 V USA | Fuse 1 AT/250 V USA |
| 4 190 051 | Sicherung 0,5 AT/250 V USA | Fuse 0.5 AT/250 V USA |
| 4 190 005 | Sicherung 0,5 AT/250 V EUR | Fuse 0.5 AT/250 V EUR |
| 4 190 103 | Sicherung 1 AT/250 V EUR | Fuse 1 AT/250 V EUR |
| 7 948 150 | Netzschalter, komplett | Power switch, complete |
| 4 182 118 | Drehschalter 644 | Rotary switch 644 |
| 4 184 166 | Leuchtdrucktaste (99-458.837) („ohne Druckkappe") | Illuminated pushbutton (99-458.837) (without button cap) |
| 7 948 951 | Drucktaste START/STOP, komplett | START/STOP pushbutton, complete |
| 7 948 952 | Drucktaste LIFT, komplett | LIFT pushbutton, complete |
| 7 948 953 | Drucktaste REVERSE, komplett | REVERSE pushbutton, complete |
| 7 948 026 | Bremse, komplett | Brake, complete |
| 7 948 028 | Bremsbacke, komplett | Brake shoe, complete |
| 7 948 039 | Federelement (Chassisaufhängung) | Spring element (chassis suspension) |
| 7 948 025 | Netztrafo | Mains transformer |
| 4 163 023 | Gleichr./S FB 1003 | Rectifier/S FB 1003 |
| 4 133 391 | Elko 10.000 µF/40 V | Elco 10.000 µF/40 V |
| 4 163 012 | Gleichr./Si. B 60 C 800 | Rectifier/Si. B 60 C 800 |
| 9 220 000 | Motoraggregat, komplett | Motor assembly, complete |
| 7 950 010 | Lift, komplett | Lift motor, complete |
| 7 948 408 | Auflagebank, komplett | Pick-up arm support, complete |
| 6 832 070 | Antriebsriemen f. Tonarmlift | Drive belt f. tone arm lift |
| 9 929 007 | Tonarm stereo/mono, komplett | Tone arm stereo/mono, complete |
| 7 950 038 | Entzerrer-Verst. stereo f. TSD | Equalizer amplifier stereo |
| 7 950 088 | Entzerrer-Verst. stereo 47 kOhm | Stereo equalizer ampl. 47 kohms |
| 7 950 039 | Leitungsverstärker-Platine | Line amplifier |
| 7 948 105 | Endstufen-Platine (Motor) | Servo amplifier board (motor) |
| 7 948 106 | Regel-Platine | Speed control board |
| 7 948 107 | Oszillator-Platine | Oscillator board |
| 7 948 108 | Interface-Platine | Interface board |
| 7 950 037 | Verstärker Stromversorgung | Amplifier power supply |
| 7 948 110 | Netzteil-Platine | Power supply board |
| 7 220 025 | Tachoverstärker | Tachometer amplifier |
| 7 948 209 | Tastenfeld-Platine | Push button board |
| 7 938 054 | SYNC-LED-Platine | SYNC LED board |
| 7 948 035 | Bedienleiste, mont. | Operating panel |
| 7 948 036 | Plattenteller, komplett | Turntable platter, complete |
| 6 948 165 | Gummiteller | Rubber mat |
| 7 948 030 | Abdeckhaube, komplett | Dust cover, complete |
| 7 948 017 | Lampenabdeckung, komplett | Lamp cover, complete |
| 4 101 248 | Diode 1 N 4006 | Diode 1 N 4006 |
| 4 101 165 | Diode 1 N 4001 | Diode 1 N 4001 |
| 4 101 230 | Diode 1 N 4148 | Diode 1 N 4148 |
| 4 101 303 | Z-Diode BZX 55/C12 | Z-Diode BZX 55/C12 |
| 4 101 513 | Z-Diode BZX 97/C2V7 | Z-Diode BZX 97/C2V7 |
| 4 101 301 | Z-Diode BZX 55/C6V8 | Z-Diode BZX 55/C6V8 |
| 4 104 003 | LED CQY 54-1 | LED CQY 54-1 |
| 4 104 006 | LED 5082 - 4950 grün | LED 5082 - 4950 green |
| 4 101 253 | Transistor BD 137 | Transistor BD 137 |
| 4 101 254 | Transistor BD 138 | Transistor BD 138 |
| 4 101 324 | Transistor BC 547 A | Transistor BC 547 A |
| 4 101 326 | Transistor BC 557 A | Transistor BC 557 A |
| 4 101 458 | Transistor BD 203 | Transistor BD 203 |
| 4 101 459 | Transistor BD 204 | Transistor BD 204 |
| 4 101 293 | FET U 1898 | FET U 1898 |
| 4 101 313 | FET P 1087 E | FET P 1087 E |
| 4 101 460 | Transistor BD 677 | Transistor BD 677 |

# Ersatzteilliste/Replacement Parts EMT 948

| | | |
|---|---|---|
| 4 101 461 | Transistor BC 517 | **Transistor BC 517** |
| 4 101 453 | IC/TO-220/MC 78 M 20 CT | **IC/TO-220/MC 78 M 20 CT** |
| 4 104 006 | LED 5082-4950 grün | **LED 5082-4950 green** |
| 4 101 446 | IC LM 324 | **IC LM 324** |
| 4 101 454 | IC/TO-220/MC 78 M 15 CT | **IC/TO-220/MC 78 M 15 CT** |
| 4 101 455 | IC/TO-220/MC 79 M 15 CT | **IC/TO-220/MC 79 M 15 CT** |
| 4 101 235 | IC µA 748 C | **IC µA 748 C** |
| 4 101 456 | IC LM 392 N | **IC LM 392 N** |
| 4 101 465 | IC CD 4046 | **IC CD 4046** |
| 4 101 466 | IC CD 4066 | **IC CD 4066** |
| 4 101 471 | IC CD 4528 | **IC CD 4528** |
| 4 101 474 | IC CD 4093 | **IC CD 4093** |
| 4 101 457 | IC LF 398 N (DIL) | **IC LF 398 N (DIL)** |
| 4 101 236 | IC µA 741 C | **IC µA 741 C** |
| 4 101 417 | IC 14011 | **IC 14011** |
| 4 101 430 | IC NE 555 V | **IC NE 555 V** |
| 4 101 462 | IC/14 Anschl./CD 4013 | **IC/14 pin/CD 4013** |
| 4 101 463 | IC CD 4040 | **IC CD 4040** |
| 4 101 464 | IC/16 Anschl./CD 4049 | **IC/16 pin/CD 4049** |
| 4 101 466 | IC CD 4066 | **IC CD 4066** |
| 4 101 470 | IC CD 4522 | **IC CD 4522** |
| 4 101 467 | IC CD 4071 BCP | **IC CD 4071 BCP** |
| 4 101 468 | IC CD 4073 BCP | **IC CD 4073 BCP** |
| 4 101 469 | IC CD 4081 BCP | **IC CD 4081 BCP** |
| 4 101 259 | IC LM 1458 CN | **IC LM 1458 CN** |
| 4 101 331 | IC LM 301 AN | **IC LM 301 AN** |
| 4 101 532 | IC NE 5533 AN | **IC NE 5533 AN** |
| 4 102 045 | Quarz 3,93216 MHz | **Quartz, 3.93216 MHz** |
| 4 106 016 | Kaltleiter 0,215 A/240 V | **PTC resistor 0.215 A/240 V** |
| 4 107 009 | Lampenzieher | **Lamp removal tool** |

**Achtung!**

**Bei Ersatzteilbestellungen und Angebotsanfragen bitte neben der genauen Bezeichnung der Teile auch Gerätetyp und Werk-Nr. angeben.**

**Durch Produktverbesserungen an Geräten der laufenden Serien und Änderungen bestimmter Industrieteile ist es unvermeidbar, daß manche Teile nicht voll kompatibel sind.**

**Notice!**

**When ordering replacement parts or requesting price quotations, please specify the unit model and serial number as well as the exact part designation.**

**Due to product improvements made during the course of a manufacturing series and to changes in particular industrial components, the incompatibility of some parts cannot be avoided.**

BARCO-EMT
Professionelle Electronic
Ein Unternehmen der Gruppe BARCO n.v.

Postfach 200 · W-7634 Kippenheim · BRD · Telefon (07825) 1011 · Telex 754319 · Telefax (07825) 2285

**Technical Information** EMT 948 / EMT 950

## Equalizer Amplifier

The equalizer amplifier consists of 3 printed circuit boards:

| | |
|---|---|
| Amplifier supply board | 7 950 037 |
| Equalizer amplifier | 7 950 038 / 088 |
| Line amplifier | 7 950 039 |

The version of the equalizer amplifier (038 or 088) depends on the pick up to be used:

| | |
|---|---|
| 7 950 038 | to be used with MC pick ups |
| 7 950 088 | to be used with MM pick ups |

## 7 950 038

This version is equipped with two input transformers 4 150 056 (1:7) to be used with MC pick ups (EMT T-series). R750 and R750' have a value of 12 kOhms.
To be used with pick ups of the EMT O-series, it is recommended, that the transformers are exchanged against 4 150 059 (1:1.3).
Modifying into version 7 950 088 means to replace the transformers with wire bridges and to exchange R750 and R750' against 68 kOhms.

## 7 950 088

This version has no transformers. It's input impedance is 47 kOhms. It is to be used with MM pick ups. R750 and R750' have a value of 68 kOhms.
Modifying into version 7 950 038 means to replace the wire bridges at the input with transformers 4 150 056 (for EMT T-series pick ups) or 4 150 059 (for EMT O-series pick ups) and to exchange R750 and R750' against 12 kOhms.

If one owns several equalizer amplifiers, there is nothing more to be done, than pull out the one, which is not needed and plug in the desired one. No electrical adjustment is necessary. But depending on the used pick up, one has still to adjust the tone arm balance.

H.-M. Fabritius
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